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GEOPHYSICAL ABSTRACTS [1]

No. 1

Compiled by Frederick W. Lee [2]

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1 - GRAVITATIONAL METHODS.

WIRELESS CONTROL OF COINCIDENCE OUTFIT FOR RELATIVE GRAVITY MEASUREMENTS

By Berger and Brückner

Zeitschrift fuer Instrumentenkunde, vol. 48, 1928, p. 366

A detailed description is given of radio apparatus for controlling a coincidence outfit for relative gravity measurements. This is probably of little interest, since many types of apparatus could be used. The general method employed is the interesting thing about this paper. As long ago as 1883 von Sterneck made a proposal to control two coincidence boxes with the same clock, and many persons have suggested the use of radio for this purpose. In accomplishing this it would appear to the reviewer that this method is probably inferior to that used by the Marland Oil Co., but Berger and Brückner must be given the credit for important advances in the coincidence method. In their apparatus a clock at a central station actuates a relay, which operates a short-wave transmitter (40 m.). At the receiving station the amplification is accomplished at low frequencies. The signal operates a relay which moves a slitted screen in a coincidence apparatus. This screen has been improved considerably, to decrease the mean error in observing a coincidence. As usual, a telescope is used to observe the flashes of light. It has a scale in its focal plane and positions of successive flashes are easily read off and recorded by a second observer. This makes possible a higher accuracy in determining the exact instant at which coincidence would have occurred at the zero point on this scale.

This method obviously depends on the constance of the mechanical and electrical lag in both sending and receiving apparatus, and may be adversely criticized from this standpoint. -- A. H. Ruark.

GRAPHIC METHODS FOR CORRECTION OF GRAVITATIONAL OBSERVATIONS WITH RESPECT TO TOPOGRAPHY, AS WELL AS WITH RESPECT TO THE SUBTERRANEAN MASSES

By B. V. Numerov

Bulletin of the Geological Committee, appendix to vol 44, No. 1, Leningrad, 1925.

Deducing briefly the formulas for the establishment of corrections of observations in connection with the topographic influence as proposed by Hayford and others, the author explains the difficulties of determination of the "gravitational anomalies" by this method and proposes to solve this problem, to great advantage, by using a map provided with contour lines, as such a solution may be attained in a geometrical way.

The solution of the problem of the influence of subterranean masses by a geometrical method is explained by the author also. -- W. Ayvazoglou.

THEORETICAL CASES FOR THE USE OF GRAVITATIONAL (GRAVIMETRIC) METHODS IN GEOLOGY

By B. V. Numerov

Bulletin of the Geological Committee, vol. 44, No. 3, Leningrad, 1925.

The author examines the problem of applying gravitational (gravimetric) methods in the study of geological formations of superstrata.

According to the author this problem may be approached by examining special examples of forms of underground strata and by calculating their influence on the gradients and on the gravity.

The following forms are examined in the article: that of a finite parallelopiped, an infinite vertical parallelopiped, and oblique rectangular prism and an oblique triangular prism.

The article gives formulas by which the sensibility of variometers and pendulums for the case of an infinite horizontal stratum may be compared.

The influence of such a stratum on the gradients, measured by a variometer, depends on the relation of the depths, while the gravity is characterized by the thickness of the stratum.

Based on the formulas, a series of tables is prepared with the aid of which the character of the changes of the gradients for any infinite prism of any position with regard to the horizontal plane may be calculated easily. -- W. Ayvazoglou.

THE INTERPRETATION OF GRAVITATIONAL OBSERVATIONS

By B. Numerov

Bulletin of the Institute of Astronomy, No. 15, Leningrad, Feb. 15, 1927

Three methods for the construction of a gravitation curve of an infinite prism of any section are examined in the article. The first method is a graphic one and consists of counting the number of sectors included within a given section. The second method is based on calculations. In the third method a special instrument, a kind of planimeter, is used.

The reciprocal problem of the interpretation of the observed gravitational curve is proposed to be solved by the method of successive approximations. -- W. Ayvazoglou.

CORRECTION OF OBSERVATIONS MADE BY MEANS OF A GRAVITATIONAL VARIOMETER WITH RESPECT TO TOPOGRAPHY

By B. Numerov

Bulletin of the Institute of Astronomy, No. 17, Leningrad, December, 1927

This paper is an exposition of an analytical and graphic method of taking topographic conditions into account when effectuating observations with the help of an Eötvös torsion balance. The integration is carried out in cylindrical coordinates. The analytical method allows the integration with respect to height to be fulfilled with the utmost accuracy; the integration with respect to the radius is carried out by means of special formulas of quadratures, taking into consideration the peculiar character of the changes of the functions being integrated. The integration with respect to the angle is produced with due accuracy on the basis of the expansion of functions under the sign of the integral into Fourier's series.

The graphic method allows the determination of the effect of topographic conditions within the limits of the radius from 50 to 500 m. and over that, with the help of graphics dividing the area into sectors of equal effect. Thus the determination of the effect of the relief leads to the calculation of the area occupied by the mass lying between two adjacent horizontals. -- W. Ayvazoglou.

GRAVIMETRIC RESEARCHES OF FERRUGINOUS QUARTZITES IN THE REGION OF KRIVOY ROG

By P. Nikiforov, S. Ghirin, A. Terentiev, and N. Veshniakov

Bulletin of the Institute of Practical Geophysics, No. 3, Leningrad, 1927, pp. 322-385

The gravimetric prospecting described in the article was carried out in the years 1925-26.

Chapter I

In addition to the description of the work itself practical features for the organization of the work are given also. The researches took place on three plots shown on the annexed map of the region. The problems of the research were as follows:

1. Location of ferruginous quartzite beds.
2. Determination of the elements of the deposit (extent, angle of inclination, magnitude).
3. Separating the ore-bearing zones and contouring the lenses.

4. Checking of the supposed faults.

Chapter II

Concerns the technical arrangement of the observations; gives description and preparation of the instruments and their distribution for the work.

Chapter III

Works out the data obtained by observation.

Chapter IV

Shows the calculated results by means of the following maps and graphics:

1. Topographical map with contours.
2. Curves of the horizontal gradient in the direction of the research lines.
3. Diagrams of the vectors of the entire horizontal component of the gravity force and curves of equal intensity of the force of gravity.
4. Graphics of the disturbing values of curves. -- W. Ayvazoglou.

2 - MAGNETIC METHODS

EXPERIMENTS ON THE MAGNETIZATION OF ROCKS

By F. Loewinson-Lessing and V. Mitkevich

Bulletin of the Geological Committee, vol. 44, No. 5, Leningrad, 1925

The idea of starting these experiments arose in connection with the magnetic anomaly observed in the volcanic group of Karadagh in Crimea.

Based on this anomaly the authors believed that the magnetization of these rocks is caused not by the terrestrial magnetism but by the atmospheric electrical discharges.

The well-known fact that the lightning which produces fulgurites in the rocks produces at the same time permanent magnetization could not be applied here, as there were no fulgurites in the Karadagh rocks; thus the question as to whether a permanent magnetization of the rocks from a distance is possible or not was to be solved.

A series of artificial magnetizations of the rocks by means of a straight electromagnet, with an iron rod 400 mm. in length and 50 mm. in diameter, was performed by the authors. A magnetic field of 3,500 gausses was used.

More than 200 samples of rocks and minerals were submitted to magnetometric tests before and after the experiments.

The rocks and minerals used for the experiments, as well as the results obtained, are given in a table.

They are arranged according to special groups, and the results are summarized by comparison of the data obtained.

Plutonic Rocks: 59 per cent of the samples tested did not display any natural magnetization, but 68.8 per cent of them became magnetized artificially and retained the magnetization permanently. Most granites were free from natural magnetization but were susceptible to artificial magnetization.

Effusive Rocks: All effusive rocks, even those magnetized by natural magnetization, may be magnetized artificially.

Contact-Metamorphic Rocks: Of the rock in the contact-metamorphic group 55.5 per cent are free of natural magnetization, but in most cases they can be magnetized sufficiently strongly.

Metamorphic Rocks: Of the metamorphic rocks 61 per cent did not show any magnetization; an intense artificial magnetization was attained for rocks with weak magnetization.

Sedimentary Rocks: Rocks classed as sedimentary are mostly free of magnetization and, in general, can not be magnetized.

Based on the experiments, the authors drew the conclusion that the permanent magnetization displayed by the rocks must in some cases be attributed to the discharges of lightning and not to terrestrial magnetism. The question as to whether there are means to distinguish the magnetization of the rocks produced by the terrestrial field from that produced by lightning was raised. The authors answer this question in the affirmative and believe that they have found the method by which the residual magnetism produced by the lightning can be determined. At the same time they express the desire that their method be applied in the study of the permanent magnetization of rocks. — W. Ayvazoglou.

THE COMPASS DIAL WITH OSCILLATING NEEDLES
(The Inclined Compass Dial)

By V. Pavlinov

Bulletin of the Geological Committee, appendix to vol. 46, No. 7, Leningrad, 1927

The article gives a detailed description of the compass dial with oscillating needles used at the present time in prospecting.

The author explains the rules necessary for taking care of the dial and insists on the necessity of studying them, as even the smallest damage to the dial, which usually can not be repaired by emergency means, makes the dial useless, thus increasing the obstacles for prospecting.

THEORIE UND PRAXIS DER MAGNETISCHEN SCHUERFMETHODEN

By Johann B. Ostermaier

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und Geologie, vol. 37, No. 1, 1929, pp. 1-3

This article is a continuation of a series started in 1927, Nos. 10, 11, 13, and 14. The author describes the construction and properties of the Kohlrausch variometer and the Bidlingmaier double compass. Interesting is the determination of temperature variations by means of thermometers of the same caloric capacity as the magnetic system or, in other words, by means of thermometers the variations of which do not lead or lag compared with the temperature variations of the magnet system. This is accomplished by using thermometers of different dimensions. Small thermometers are leading, while large thermometers are lagging in regard to the temperature variations of the magnet system. -- T. Zuschlag.

THE INFLUENCE OF TOPOGRAPHY ON THE EARTH MAGNETIC VERTICAL FIELD

By J. Koenigsberger

Sonderdruck aus Gerlands Beitraege zur Geophysik, vol. 20, No. 3/4, 1928. Akademische Verlagsgesellschaft m. b. h., Leipzig.

The unevenness of the terrain causes a topographic effect on the magnetic vertical intensity Z, which is difficult to deduce theoretically. An extremal positive and negative value for ΔZ (the additional vertical intensity) for a certain susceptibility, K, apparently is $\Delta Z = \pm 4\pi KZ$. This effect for $K \leq 0.01$ is almost proportional to K. The largest difference between summits (+) and steep valleys (-) observed in mountains of gneissic rocks (Bellinzona, Ticino, Switzerland) was about 120 γ. The vertical intensity in the immediate neighborhood of the wall of the quarry was about -40 γ. In case of a very small K, the effect observed was equal to zero. Thus, the effect depends on the angle of the slope and should depend on the situation of the wall to the magnetic meridian; but this latter dependence could not be observed. Therefore, by the topographic effect the value of the susceptibility of large masses of rock in the earth magnetic field can be calculated approximately. The observations were made with a vertical variometer which gives an accuracy of about $\pm$ 3 γ for the results. The local inhomogeneity of the places where the topographic effect was studied was about $\pm$ 4 γ. -- W. Ayvazoglou.

INTERPRETATION OF CHARTS OF MAGNETIC ISANOMAL CURVES AND PROFILES (WITH 9 FIGURES).

By J. Koenigsberger

Sonderdruck aus Gerlands Beiträge zur Geophysik, vol. 19, No. 2, 1928.
Akademische Verlagsgesellschaft m. b. h. Leipzig.

The isanomal curves for the vertical and horizontal intensity and for the inclination with respect to the surface of the earth, based on the exact theory of induction, are given by formulas and figures for a sphere and for an oblate ellipsoid of revolution; it is also shown how the depth of their centers under the surface of the earth can be calculated. The formulas are given for the isanomal curves of the vertical component which are caused by an elongated ellipsoid of revolution with vertical axis and an oblate ellipsoid of revolution in different positions. The characteristic parameters can be found in tables with the aid of which - and by interpolation, also, for some curves - the center depth and, in case of comparatively small depth, the form and position of the ellipsoid also can be found.

The conclusions drawn from magnetic charts of vertical intensity anomalies are as follows: The magnetic anomalies show the depths of the center of the disturbing mass from the surface to be between 0.2 to 20 km.; comparatively often depths of from 3 to 6 km. were found. Conducting channels of masses belonging to effusive rocks on the surface have a depth of from 3 to 6 km.; their continuation down to the plastic zone is dipping under gentle angles. The higher zone, partially of effusive type, of these basic rocks has a depth of center from 300 to 1000 m., and the same is approximately true for some so-called plutonic rocks, which therefore do not always continue in great depths. The great anomalies marked on maps with scale of 1:1,000,000 or more have very varying depths of center of from 0.3 to 30 km. -- W. Ayvazoglou.

APPARATUS FOR CALIBRATION OF MAGNETOMETERS

By W. Pavlinoff

Bulletin of the Institute of Practical Geophysics of the Supreme Council of Public Economy, No. 2, Leningrad, 1926, pp. 177-183

This paper deals with the task of constructing an instrument capable of producing easily and with precision a homogeneous horizontal and vertical magnetic field of a desired intensity within the bounds of a sphere 30 cm. in diameter.

The apparatus constructed by the author represents a system of two magnetic shells in Helmholz's arrangement.

The diameter of the instrument is about 7 feet and the number of windings in both coils together is 158.

The instrument can be placed so that its axis coincides with the vertical line, or the axis can be placed horizontally in every azimith. The electric current is measured by Weston's amperemeter of high sensitivity. Any magnetometer can be examined by this instrument and its curves can be constructed. The characteristic curves of the Tiberg-Thalen and Thomson-Thalen magnetometers are given in the appendix to the article. -- W. Ayvazoglou.

THE MAGNETIC FIELD OF BODIES OF REGULAR SHAPE FROM THE VIEWPOINT OF MAGNETOMETRIC STUDIES

By J. Bahurin

Bulletin of the Institute of Practical Geophysics, No.2, Leningrad, 1926,pp.1-63
Bulletin of the Institute of Practical Geophysics, No.3, Leningrad, 1927,pp.148-255

In Chapter I the author examines the magnetic field of an oblate ellipsoid of revolution magnetized in the direction of its axis of revolution. Diagrams showing the vectors of total intensity and the lines of equal values of horizontal and vertical intensities produced by the ellipsoid, as well as tables for the calculation of the data of vertical and horizontal intensities for any ellipsoid of revolution, are given.

Chapter II considers the magnetic field of an infinitely long elliptical cylinder. The situation of the characteristic points of the field and their relation to the dimensions and to the depth of the ore body are established by detailed mathematical analysis.

The article is completed by many tables and diagrams.-- W. Ayvazoglou.

MAGNETIC PROSPECTING IN THE IRON ORE REGION OF THE PROVINCE OF TULA

By N. Rose

Bulletin of the Institute of Practical Geophysics,No.3, Leningrad,1927, pp.137-147

The object of the magnetic work carried out by the author consisted of establishing the influence of the deposits of weak magnetic limonite on a magnetic field at the surface; the thickness of the horizontal ore layers of the region is about 36 m. and the depth is from 21 to 27.6 meters. The magnetic surveying was carried out by means of Moureaux-Chasselon's magnetic theodolite and Dover's needle indicator.

Two courses of 16 points each with an average distance between them of about 640 m. were made. Deviations from the normal values of the magnetic elements in the point of intersection of the ore fields by the course are given in tables and diagrams. -- W. Ayvazoglou.

3 - SEISMIC METHODS

THE SEISMOGRAPH IN THE GULF COAST

By Mark C. Malamphy

The Oil Weekly, Jan. 18, 1929, pp. 31-34

A brief review of the history of seismographic exploration in Texas is followed by an elementary description of the fundamental ideas involved in the method, the principles on which the different types of seismographs are based, and a statement of the main physical facts which determine the velocity and path of an explosion wave through the ground. This is followed by an outline of the method of working and of interpreting the results, illustrated by a diagram and graphs of the time-distance curve. These graphs are entirely imaginary and represent what the writer thinks should happen under the assumed conditions according to the still popular "Mintrop theory;" no other method of interpretation is mentioned, so that the reader is left to infer that these ideas are universally accepted. The last half of the article is devoted to a description of field methods, as used for the finding of "salt domes," the organization of field parties, estimates of cost of such exploration, difficulties of operation, and many practical details which should be very valuable to any company contemplating such work. -- Kenneth Hartley.

4 - ELECTRICAL METHODS

CONCERNING SOME PHENOMENA OBSERVED DURING THE ELECTRICAL METHOD OF PROSPECTING

By F. Shkliarevsky

Bulletin of the Geological Committee, appendix to vol.44, No. 2, Leningrad, 1925.

This article describes prospecting by the electrical method, in particular the method of equipotential lines, using the linear electrodes.

Copper pyrites and the sericite schists deposited in greenstone ores were prospected. The author gives explanation of some phenomena by which the conditions of work were made difficult; he mentions especially the fact that an absolute damping of the sound in the telephone of the feeding circuit could not be obtained. According to his opinion the main reasons for this were:

1. The damping was prevented by the induction of circuits in the neighborhood of the electrodes and of the feeder connecting the generator with the electrodes.

2. A phase displacement caused by self-induction.

3. The inductional humming produced in the neighborhood of the pyrites.

The author concludes that there were other phenomena observed during the electrical prospecting which could not be explained satisfactorily by him, thus the cooperation of expert electrophysicists for solving these phenomena is very desirable. -- W. Ayvazoglou.

RADIO IN ORE PROSPECTING

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.1, Leningrad, 1925, pp.135-151

Contents of the article:

1. First tests with radio for prospecting purposes (Trustedt, Lowery and Leimbach).

2. The shade or absorption method.

3. The beam or reflection method.

4. The interference or superposition method.

5. The return method or quarter-wave.

6. The wave measuring method.

7. The measuring of short waves.

8. The present state of these methods.

The methods are illustrated by plans showing the cross sections of the terrain. -- W. Ayvazoglou.

ELECTRIC CONDUCTIVITY OF ORES AND ROCKS

By D. Murashov, E. Berengarten, A. Etcheistova and L. Khudiakova

Geological Committee. Series of applied Geophysics and Prospecting. No. 1, Leningrad, 1928.

The present paper contains the summarized results of a series of measurements of the electric conductivity of various ores and rocks from a number of deposits, in respect to which the question has arisen, or may arise, as to the applicability to them of the methods of electrical prospecting.

Methods of measurement are described. The results obtained from the investigation of the specific resistance of 180 samples, as well as the mineralogic and petrographic composition of the latter, are shown in the appended tables.

The samples characterize various deposits of the Ural, Caucasus, South Russia, Kazakstan, Altai, and Central Siberia.

Fully amenable to the successful application of methods of electric surveying are various more or less continuous pyritic copper and polymetallic ores with prevalence of pyrite, chalcopyrite, bornite, chalcocite, galenite, and arsenopyrite, enclosed in metamorphic schists, limestones, and other rocks. -- W. Ayvazoglou.

ERDOEL IN MECKLENBURG-SCHWERIN (GERMANY)

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau, und Geologie, vol. 37, No. 2, 1929, p. 16

The Luebthen-Jessenitz dome was investigated by seismic and electric methods after a dry hole northeast of the dome had been abandoned at a depth of 650 m. According to the electric investigations of Piepmeyer and Co., oil should be expected at 1,000 to 1,200 m. depth on the northwestern part of the dome. The Mecklenburg Landtag has provided the money for the drilling operations to check up this prediction. Near the village of Oberg five producers of 10 to 30 tons per day were brought in at a depth of 510 to 550 m. -- T. Zuschlag.

OIL IN MECKLENBURG-SCHWERIN

By H. Rantenkranz, Celle.

The salt dome of Luebthen-Jessenitz has been known for several decades already.

In 1927 a drill for oil was abandoned because at a depth of 650 m. there was still found younger Tertiary. With seismographs and electric methods the Northeast and Northwest boundaries of the salt dome have now been accurately determined, and a new drill has been decided. According to the electric indication the oil would occur at a depth of 1,000 to 2,000 m. Another occurrence of oil has been lately discovered near Oberg. Five drills have reached the oil horizon at a depth of 510 to 550 m. and yield a daily production of 10 to 30 tons. The thickness of 10 to 15 m. of the oil horizon seems to promise a continuous production. -- W. P. Jenny.

ELECTROMETRIC METHODS IN ORE PROSPECTING AND EXPERIMENTAL INVESTIGATIONS AT RIDDER'S MINE DURING THE SUMMER OF 1924

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics,No.1, Leningrad, 1925,pp.107-132

The author describes the results of the detailed investigations made at Ridder's Mine (Altai). The method of the measurement of the natural direct currents, as well as that of the measurement of the artificial direct currents (Kelly's method), with a few modifications introduced by the author, were used. The modifications concern the method of moving the electrodes and of adding resistance. Petrowsky's method of introducing the current into the earth by means of a great number of small electrodes placed along the boundary of the investigated field and connected with each other by wire on a state of equal potential (called by him the "Dot system of arranging electrodes") takes rank between Schlumberg's and Lundberg's methods. According to the author it was used with great advantage.

The article is illustrated by pictures and diagrams. — W. Ayvazoglou.

NATURAL ELECTRIC FIELD PRODUCED BY ORE

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics,No.1, Leningrad, 1925,pp.87-104

The following questions are examined in the article:

1. The natural circumstances and conditions by which a natural electric field is produced by ore.
2. The basis of the theoretical examination of this question.
3. Differential equations and limitations in the case of an infinite medium.
4. The expression for the electric potential and potential gradient in this case.
5. A polarized sphere in a medium limited on one side by a plane.
6. The final equation of the electric potential and the potential gradient.
7. The transformation of the formulas.
8. The examination of an electric field along a plane of polarization created by an ore body.
9. The examination of an electric field along a plane perpendicular to the plane of polarization.

The article is provided with the following diagrams:

1. The electric currents produced by the ore body.
2. Vertical and horizontal sections of a polarized sphere.

3. Electric field produced by the polarized field.
4. Polarized sphere and its electrical representation.
5. Distribution of the electric power along the axis of the abscissas.
6. Distribution of the electric power along the axis of the ordinates.--
W. Ayvazoglou.

DETERMINATION OF THE LOCATION, DEPTH AND THICKNESS OF A SPHERICAL ORE BODY BY OBSERVING THE EARTH CURRENT PRODUCED

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.3, Leningrad, 1927, pp.3-36.

Contents:

Chapter I

1. The problem and the formulas obtained by its analysis.
2. The general nature of the electric profile in the plane of polarization.
3. The zero curves.
4. The maximum curves.
5. The general nature of an electro-profile which is obtained in a plane perpendicular to the plane of polarization.
6. The zero curves.
7. The maximum curves.

Chapter II

1. The determination of the location, depth, and thickness of a spheric ore body.
2. Graphic calculation.
3. Analytic calculation.
4. Graphic interpretation.

Chapter III

1. The formulas which express the gradients of the potential along a line that is inclined to the plane of polarization.
2. The general nature of an electroprofile in a plane that is inclined to the plane of polarization.
3. The zero curves.
4. The maximum curves.
5. The full scheme of the observation and calculation of the elements that characterize the spheric body.

The article is illustrated by many diagrams. -- W. Ayvazoglou.

CALCULATIONS OF AN ARTIFICAL ELECTRIC FIELD

By A. Petrowsky

ulletin of the Institute of Practical Geophysics,No.3, Leningrad, 1927, pp.39-63.

Contents of the article:

1. The relation between the charge and strength of the current in a hree-dimensional system.
2. The Schlumberger field.
3. The Petrowsky field.
4. The Lundberg field.
5. The equipotential lines and current lines of the field.
6. Procedure of the calculation of potential values.
7. Application of the special tables.
8. Procedure of the calculation of equipotential lines.
9. Procedure of the calculation of potential gradient.

The procedures of the calculations of (6) and (9) as well as the applica- ion of special tables (7), are given in the form of examples. -- W. Ayvazoglou.

THEORY OF THE MEASUREMENTS OF EARTH CURRENTS

By A. Petrowsky

ulletin of the Institute of Practical Geophysics, No.1, Leningrad,1925, pp.73-87.

Contents:

1. The problem (what appearance have equipotential surfaces and lines f force when conducting into the earth a receiving electrode of spheric shape?).
2. Differential equations and limitations of the influence of an lectrode in an unlimited space.
3. A general integral for an E-potential.
4. The meaning of the arbitrary constant.
5. The influence of a flat limited surface upon the E-potential.
6. The meaning of the E-potential in this case.
7. The potential of a spheric electrode half buried in the ground.
8. The distribution of the equipotential surfaces and of the current ines with different conditions.

By the aid of the formulas calculated, a series of graphs showing the lectric field near an electrode is calculated and drawn. -- W. Ayvazoglou.

ELECTROMETRIC INVESTIGATION OF THE UPPER-ARSHINSK (URAL) ORE BED, ACCOMPLISHED IN SUMMER OF 1926.

By A. Petrowsky, R. Skariatin, and L. Kleiman

Bulletin of the Institute of Practical Geophysics, No.3, Leningrad,1927, pp.64-86.

The chief problem consisted in stating to what extent the results expected from the electric method of investigation may agree with the results of an ordinary prospecting.

The work consisted of:

1. Surveying of isolines by means of an alternating current.
2. Surveying of gradients by means of direct current.
3. Supplementary measurements, such as the resistance of the ground in different parts of the field, distribution of the intensity along the conducting line of the electrode, and voltage drop on principal and auxiliary lines.

A benzine motor coupled with an alternator of high frequency and a direct current dynamo were used as a generating set. The results of the electric investigation were considered favorable, as the data obtained agreed with those procured by direct digging. -- W. Ayvazoglou.

THEORY OF THE RETURN METHOD

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.2, Leningrad,1926,pp.143-173

Contents:

1. The nature of the return method.
2. The conception of an electromagnetic representation.
3. The conditions to which an electromagnetic field should conform.
4. The values of the component of the electromagnetic force, at any point of a field, which is created by an antenna and its electromagnetic field on a level surface.
5. The total electric and magnetic force at any point of the field.
6. The values for the component of the electric and magnetic forces and of their image on a level surface, if the forces are created by the dipole of Hertz.
7. The influence of the returning wave upon the dipole.
8. The transposition of the obtained formulas.
9. The examination of the dependence of the reaction upon the dipole from the inclination of the reflecting surface.
10. The calculation and graphic construction of the auxiliary values γ and γ_3 that enter the coefficients of the reaction curves.

11. The calculation and graphic construction of the coefficient
nemselves.
12. Supplementary constructions.
13. Calculation and graphic construction of a complete reaction curve
or a dipole.
14. Reaction curve for an ideal dipole.
15. Reaction curve for a dipole that has some leakage.
16. Reaction curve for a symmetric and straight conductor.
17. Reaction curves for small coils. -- W. Ayvazoglou.

5 - RADIOACTIVE METHODS

ON THE THEORY OF AN ASPIRATOR DEVICE FOR THE INVESTIGATION OF ORE SAMPLES WITH REGARD TO THEIR RADIO ACTIVITY

By V. J. Baranov

Bulletin of Geological Committee, appendix to vol. 44, No. 4, Leningrad, 1925.

The theory of the device, based on the natural ionization of radio-
ctive bodies is proved by experiments.

A diagram shows curves obtained by theoretical calculations as well as
hose obtained by experiments.

In addition to the direct purpose, that is of the investigation of radio-
ctivity of ore samples for which the device is constructed, the device may,
ccording to the opinion of the author, be used also for preliminary comparison
f the radioactivity of rocks instead of the Elster and Gietel method. --
. Ayvazoglou.

APPLICATION OF EBERT'S ION-METER FOR A RAPID DETERMINATION OF THE RADIO-ACTIVITY OF THE SAMPLES ON THE SPOT

By V. J. Baranov

Bulletin of the Geological Committee, appendix to vol. 46, No. 1, Leningrad, 1927.

The author proposes to provide the groups assigned for the research of
adioactive deposits with Ebert's ion-meter owing to the importance of the in-
estigation of the ionization of the air in the region of the research work and
the possibility of a rapid determination on the terrain itself of the radio-
ctivity of the samples collected.

A full description of the instrument and its operation is given in the
rticle. -- W. Ayvazoglou.

ASPIRATOR FOR INVESTIGATION OF RADIOACTIVITY OF THE SAMPLES OF ORES IN GEOLOGICAL COLLECTIONS

By A. P. Kirikov

Bulleting of Geological Committee, appendix to vol. 44, No. 1, Leningrad, 1925.

The idea of the device is based on Ebert's principle which consists of counting the ions by catching them on a charged electrode placed in a tube through which a fixed volume of air passes. Data characterizing the work of the device are given in a table, and the operation of performing measurements is explained. The device may be used with great advantage for establishing deposits of radioactive ores by testing samples of existing collections. The determinatio of a relative radioactivity of ores in a box with about 40 samples requires from one to two minutes only. Experiments performed with the aid of the new device were very satisfactory. The apparatus is intended only for investigation of samples and not for a field device. -- W. Ayvazoglou.

6 - GEOTHERMAL METHODS

THE CALCULATION OF THE INFLUENCE OF ROCKS ON THE NATURAL AND ARTIFICIAL HOMOGENEOUS FIELDS IN THE GROUND

(Problems of Geothermics, Earth Magnetism, and Geoelectrics)

By J. Koenigsberger

Sonderdruck aus Gerlands Beiträge zur Geophysik, vol. 18, No. $\frac{1}{2}$, 1927. Akademische Verlagsgesellschaft m. b. h. Leipzig.

In addition to the statements made by Maxwell, the author shows us how the mathematical expressions, calculated for the influence of rocks (spheres and ellipsoids of rotation) on a primary homogeneous field of geothermics, earth magnetism, and geoelectrics, can be derived by taking into consideration their borders on the earth surface. The application of general theorems is examined in a special case, that of the deviation of geoelectric current lines on the surface of the earth (Schlumberger's probe method) caused by a sphere and oblate ellipsoid of rotation in the ground. The probe method is compared briefly with the integral method or methods in which all factors enter, and some practical conclusions are derived. -- W. Ayvazoglou.

INTERNAL HEAT OF EARTH IS STUDIED TO ASCERTAIN FACTS ON WHICH TO BASE GEOLOGICAL PRINCIPLES

By C. E. Van Orstrand, Geophysicist, Geological Survey

The United States Daily, Washington, D. C., Feb. 15, 1929.

The question of the internal heat of the earth has been studied almost from the time of the establishment of the U. S. Geological Survey in 1879. In 1920 a report on geothermal data, based generally on the observations made by placing a thermometer in the water flowing from the mouth of a well, was published by N. H. Darton. In this report it was noted that in certain areas in eastern South Dakota the rates at which the temperatures increase from the surface downward vary somewhat uniformly from about 1° F. in 20 feet to approximately 1° F. in 45 feet. But this method of making temperature tests has proved to be not satisfactory, thus the author of this article undertook the task of designing and constructing the apparatus necessary for more accurate measurements. Two different types were developed, one of which was based on the electric resistance thermometer, and the other on the mercury thermometer of the maximum type. It has been necessary to abandon the electric method for the present, owing to the fact that the cable that will meet the requirement of withstanding the dissolving action of oil and salt water must be of relatively large diameter, possibly one-half or three-fourths of an inch; it becomes of such weight and proportions that it can not be manipulated in a deep well without the aid of powerful machinery.

The machine which is being used to-day for lowering mercury thermometers into a well by means of a piano wire consists of a steel frame and reel, a standardized wheel for accurately measuring depths, and a cylindrical cam which distributes the wire on the reel and thus prevents the transmission of impacts to the thermometers as a result of the slipping of the coils of wire on the reel. No power, other than hand power, is needed. It is a remarkable fact that a machine weighing 58 pounds, exclusive of the piano wire, which weighs 2.7 pounds per 1,000 feet, can be used to sound wells to depths of more than 4,500 feet.

Concerning the question of the value of temperature tests the scientists were not yet able to give a definite answer.

It has been assumed ordinarily that during the millions of years of the earth's existence its outer layers have gradually cooled to depths of about 200 miles. In contrast to this hypothesis is the comparatively recent supposition that practically all of the heat of the earth is due to the disintegration of radium. There are at present wide differences of opinion with regard to the causes of the irregular distributions of heat in the outer layers of the earth's crust. Thus, it has long been known that the temperatures at the same depths in different localities are not the same. For example, at Fairmont, West Va., a temperature of 170° F. was found at a depth of 7,500 feet; while at Longmont, Colo., a temperature of 212° F. exists at a depth of only 6,600 feet. In general the rates at which the temperatures increase with the depth vary from the extremely rapid rate of 1° F. in 20 feet (the value found in some of the oil

fields in Wyoming) to 1° F. in 200 feet (gold mines at Johannesburg, South Africa). No serious attempts have been made to explain these variations in the temperature of the rocks at the same depths until the U. S. Geological Survey found in some oil fields in Wyoming and California that the temperatures of the rocks at given depths were higher than the temperatures found at the same depths in the rocks immediately surrounding the fields.

The peculiar distribution of heat existing in these oil domes is attributed to the radioactivity, or, possibly, to the chemical reactions within the oil itself. Other investigators sought the explanation in deepseated intrusive masses, conduction of heat in the rocks, and the migration of waters in deeply buried sands. It is impossible at present to render a final decision as to the merits of all these hypotheses.

Most intensive investigations are conducted to-day in the United States as a result of cooperation of various organizations, and the author believes that a precise geothermal survey will ultimately provide the facts on which certain fundamental principles of geology may be established. -- F. W. Lee.

7 - UNCLASSIFIED METHODS

GEOPHYSICAL METHODS USED FOR PROSPECTING OF ORE DEPOSITS

By A. K. Gedovius

Bulletin of the Geological Committee, vol. 44,
No. 1, Leningrad, 1925.

After giving a brief description of the fundamental purpose of applied geophysics, the author enumerates the geophysical methods used for prospecting of ore deposits. He divides the methods into two groups, according to the physical properties of ore bodies.

In the first group he includes those methods characterized by a direct manifestation of the ore bodies at a certain distance (magnetic method, gravitational method, and radioactive method).

In the second group are the methods by which he examines the physical properties of ore bodies which, although not manifested at a distance, influence the distribution of the electric energy sent into the ground by artificial means (methods based on electric conductivity and dielectrical constant, and the seismic method).

A brief historical review of the development of the methods, as well as a few examples illustrated by diagrams, is given. -- W. Ayvazoglou.

8 - GEOLOGY

NEUE ERDOELVORKOMMEN IN BULGARIEN

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und Geologie, vol. 37, No. 1, 1929, pp. 7.

Indications of oil were found near Tschirpan, Rupki, and Swoboda. Professor Bontschew, Bulgarian geologist, has been asked by the Bulgarian Government to make investigations. -- T. Zuschlag.

ERDGAS BEI SISAK, SHS

By Dr. Lupas Waagen

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und Geologie, vol. 37, No. 2, 1929, pp. 9-10

The newspaper report that oil was found near Sisak is not true. However, gas was struck while drilling water wells. The author discusses the geology and general structure of the Sisak plain, as well as the special conditions under which the gas was found. -- T. Zuschlag.

DAS ERDOELGEBIET DER HALBINSEL SANTA ELENA (ECUADOR)

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und Geologie, vol. 37, No. 1, 1929, pp. 4-5

The article is an abstract of a geological report by Cunningham Craig. The general geology, structure, the known resources and the methods of production are discussed briefly. -- T. Zuschlag.

DIE ERSTEN ERFOLGREICHEN ERDOELBOHRUNGEN IN BRASILIEN

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und Geologie, vol. 37, No. 3, 1929, p. 22

The Brazilian Ministry of Agriculture announces that the first important wells in Brazil were brought in near Botocatu and Piracicaba in the State of Sao Paulo. Chief Engineer Schemmuly investigated several locations in the States of Parana and Sao Paulo by means of his patent Polarisator.. His predictions were proved on the Facendas Barro Branco and Maria Isabella near the Rio Iguassu, as

well as on Facenda Araqua near Piracicaba. On Facenda Saltinho near Botocatu on the Rio Tiete he predicted oil in five horizons down to 1,600 m. depth. -- T. Zuschlag.

THE DRILLING ACTIVITY AT BORYSLAW FROM 1924 TO 1928

By Dr. Alfred Pfaff, Soln, near Muenchen

Abstracts from "Petroleum" vol. 25, No. 1.

Detailed tables are given about the drilling activity of the different oil companies at Borýslaw from July 1, 1924, to July 1, 1928. The tables show that the small companies have developed a much larger percentage of drilling activity than the larger concerns, which conclusion would be in favor of a decentralization of the oil industry at Boryslaw.

From 1924 until 1928, there have been drilled at Borýslaw a total of 130.017 m.; i.e. 96,000 m. for new drills at an average cost of 570 zloty per meter, and 34.017 m. for deepenings at an average cost of 1,600 zloty per meter. The daily production in July, 1923, amounted to 148,55 cisterns from a total of 338 wells with an average depth of 1500 m.

The annual production of 54,000 cisterns has been quite constant for the last few years and corresponds to 20.3 completely drilled wells per year. The average total production of a well is therefore 2,660 cisterns, or 83.6 per cent of the total production in 1913, which amounted to 3,182 cisterns.

In order to encourage the drilling activity, and especially the deepening of old wells, a new system of taxes is proposed, which is to increase the taxes with increasing daily production of the well. -- W. P. Jenny.

Bulgaria

In the neighborhood of the town of Tschirpan in Central Bulgaria there have been found very promising indications of oil, which are being examined by Professor Bontchev of the University of Sofia. Beside the indications near Tschirpan, oil has been found under a layer of hard rock at a few meters depth near Roupki and Svoboda, both in the county of Tschirpan. Great interest has been shown in these oil deposits by foreign concerns. -- W. P. Jenny.

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DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS [1]

No. 2

Compiled by Frederick W. Lee. [2]

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2 - Senior physicist, U. S. Bureau of Mines.

1 -- GRAVITATIONAL METHODS

THE EÖTVÖS TORSION BALANCE

Anonymous (probably Capt. H. Shaw and E. Lancaster-Jones)

Published privately by L. Oertling, Ltd., as a manual to be used with their torsion balance. London, 90 pages; undated, but late in 1925 or early in 1926.

The content of the book covers: (1) The theory of the Eötvös torsion balance; derivation of the working formulas; description of the instrument; method of observation; relation of the magnitudes observed to the lines of force and the level surfaces of gravity; corrections or normal effects, near and distance terrane; subterranean effects; effects due to certain mathematical bodies. (2) Notes on the practical employment of the Eötvös torsion balance; initial testing of the instrument and of accessories; hints on planning the survey; work at the station site; office computation and plotting of results; the interpretation of the results. (3) A description of the instrument and instructions for its manipulation.

This book was the best discussion in English on the theory and use of the Eötvos torsion balance and is surpassed only by a later paper by the same authors that covers much of the same ground. The book is suitable for a textbook for beginners, and advanced students will find it of use. It should be available as a reference book in all geological libraries and in all torsion balance department offices.

The discussion is authoritative and is given as simply as it is possible to give theory that is not very simple. Formulas for the terrane correction calculated by Schweydar's method are given in terms of tenths of feet difference in elevation and may be welcome to some who desire feet throughout in the measurements. -- Donald C. Barton.

THE EÖTVÖS TORSION BALANCE METHOD OF MAPPING GEOLOGIC STRUCTURE

By Donald C. Barton

Am. Inst. Min. Eng. Tech. Pub. No. 50, February, 1928, 51 pp., 13 figs.

An excess or deficiency of mass causes a warping of the level surfaces and of the lines of the vertical. Either type of warping gives a small horizontal component to gravity at each of the two weights of an Eötvös torsion balance. That small component in one case is proportional to the differential curvature of the level surfaces and in the other case, to horizontal gradient of gravity. The formulas for the calculation of the differential curvature and of the gradient from observations with the torsion balance are derived

geometrically. The effects measured by the torsion balance are the vectorial sums of the effects produced by the topographic, the planetary, and the geologic irregularities of the distribution of mass. By running levels and using certain formulas, corrections can be applied to compensate the effects of topography of minor relief. A correction varying with latitude is applied to compensate the planetary effects. From a study of the residual geologic anomalies, it is possible to interpret certain features of the geology. The theoretical gradient and differential curvature profiles are given for a vertical and a 30° fault cutting formations of increasing density downward, of an infinite symmetrical structural ridge, and infinite asymmetrical structural ridge, a finite asymmetrical structural ridge. Illustrations of actual torsion balance work are given as follows: the survey which led to the discovery of the Nash salt dome, Tex., and the prediction of the limits of the dome and its verification by subsequent drilling; calculation of the extension of the cap rock on the Hoskins Mound salt dome and the subsequent verification by drilling; a profile across the Luling fault, a survey of a buried granite Ordovician ridge in Cooke County, Tex., and an analysis of a survey of the Fox oil fields, Oklahoma. The torsion balance has a distinct place and a good future in mapping geologic structure; in some situations it works brilliantly but is not a panacea for mapping geologic structure and can not replace but merely supplement geology. Although it is easy to train an observer, the interpreter must be a well trained and experienced geophysicist and geologist. The torsion balance offers usefulness in certain types of pure-science geologic problems. -- Author's abstract.

RESULTS OF TORSION BALANCE MEASUREMENTS IN SCHLESWIG-HOLSTEIN (ERGEBNISSE VON DREHWAAGEMESSUNGEN IN SCHLESWIG-HOLSTEIN)

By Karl Jung

Ztschr. fuer Geophysik, Jahrg., 4, Heft 7/8, 1928, pp. 395-450.

A single profile was run with a torsion balance between Husum and Flensburg across the positive magnetic anomaly mapped by Reich. The gradient values show several anomalies of much lesser size than the magnetic anomaly, but the profile of $\triangle$G shows a very rough parallelism to the profile of $\triangle$Z. Approximate determination of depths by Jung warrant the suggestion that uplifted ancient rocks are the cause of those gradient anomalies, as Devonian is known to be practically at the surface at one place on the profile, but irregularities of the topography on the Tertiary or irregularities in the diluvium may cause such gradient anomalies. The anomalies of $\triangle$G and $\triangle$Z are both apparently due to some deep-seated anomalous mass. -- Donald C. Barton.

GRAVITY SURVEYING IN GREAT BRITAIN

By H. Shaw

Am. Inst. Min. and Met. Eng. Tech. Pub. 74, 1928, 14 pp. Also in Geophysical Prospecting, 1929., Am. Inst. Min. and Met. Eng., 1929, pp. 530-543.

The intensive torsion balance work in Great Britain has been in connection with the location of usually large and irregular deposits of iron ore. The situation was complicated by the presence of 0 to 250 feet of heterogeneous glacial drift, a subdrift topography with considerable relief on limestone, and numerous faults. On account of the superficial heterogeneity seriously affecting the differential curvature, it was neglected, and only the gradient was used. A station interval of 100 and in some cases of 50 feet was used. Many details of the field practice are given. The paper unfortunately is not illustrated with any of the results of the survey. -- Donald C. Barton.

COMPUTATION OF EÖTVÖS GRAVITY EFFECTS

By E. Lancaster-Jones

Am. Inst. Min. and Met. Eng. Tech. Pub. 75, 1928, 55 pp. Also in Geophysical Prospecting, 1929., Am. Inst. Min. and Met. Eng., 1929, pp. 505-559.

The paper summarizes practically all the known formulas for the calculation of Eötvös gravity effects. Many of the formulas are given in a mathematically pretty but very condensed notation which is rather forbidding to the uninitiated but which becomes clearer after a little study. The formulas are handled under the headings of formulas for point elements, line elements, terrane features, topographical features, cartographic features, three dimensional features bounded by plane surfaces, irregular three dimensional figures (Nikiforov's method), and change of axes.

This paper is a most useful compendium of formulas. -- Donald C. Barton.

A CARTOGRAPHIC CORRECTION FOR THE EÖTVÖS TORSION BALANCE

By C. A. Heiland

Am. Inst. Min. and Met. Eng. Tech. Pub. 52, 1928, 17 pp. Also in Geophysical Prospecting, 1929., Am. Inst. Min. and Met. Eng., 1929, pp. 544-560.

The "cartographic correction" is the correction for the effect of the topography beyond 100 meters from the instrument. Eötvös used a simple but approximate formula; Schweydar used more rigorous formulas. The writer divides

he terrane into zones bounded by radii and concentric circles. By assumption f certain approximations, a formula is derived which depends on certain co-fficients and the square of the elevation referred to the center of gravity f the instrument as the origin. Rule-of-thumb tabular calculation forms, ncluding the coefficients, can be set up; the squares of the elevations are ntered in the proper spaces and added or subtracted and multiplied by an ndicated routine. The respective calculations for U_{xz}, U_{yz}, U_{xy}, and $U_{\triangle}$ ch require a separate form.

This is a valid method of calculating the cartographic correction. But is type of method of calculation of the correction is being superseded by raphical methods or methods making use of tables of effects rather than bles of squares. -- Donald C. Barton.

A NEW GRAPHICAL METHOD FOR TORSION BALANCE TOPOGRAPHIC CORRECTIONS AND INTERPRETATIONS

By C. A. Heiland

Bull. Am. Assoc. Petrol. Geol., vol. 13, No. 1, Jan., 1929, pp. 39-74.

The graphical methods suggested by Numerov, Nikiforov, Jung, Lancaster-nes, Barton, and Haalck involve approximations which the author seeks to oid by a graphical method making use of spherical coordinates. The space ound the origin is divided into 16 equal vertical sectors. The gradient and fferential curvature effects of the 16 sectors are shown by six different aphs. The construction of the graphs is described. To use the graphs the pographic or structural profiles are constructed for the 16 sectors and perimposed on the respective graphs. The effects are determined by counting mass elements of the graph and multiplying by the respective density factors. ese graphs according to the author, are applicable (1) to the computation of pographic corrections and of corrections for mine openings in underground rsion balance work, (2) to computations of the influence of two and three mensional subterranean features in torsion-balance interpretations; and (3) computations of the influence of such structures on the magnetometer.

This method is a valid and workable one for handling extremely compli-ted topographic corrections in regions of rough relief. As given, the afting of the topographic profiles will be found too tedious for most commer-al surveys. But a slight modification of the method with the use of templates d contour maps will be a valid and workable one for most commercial surveys. e method is unworkably complicated for most calculations in connection with bsurface structures. -- Donald C. Barton.

CALCULATIONS IN THE INTERPRETATION OF OBSERVATIONS WITH THE EÖTVÖS TORSION BALANCE

By Donald C. Barton

Geophysical Prospecting, 1929, Am. Inst. Min. and Met. Eng., 1929, pp. 480-504.

Success in interpretation of the observations depends in considerable part on the knowledge gained by calculating the effects produced by known bodies or by calculating the bodies which will produce a known effect. Most of the simpler geologic structural situations may be split into horizontal rectangular prisms, and the effect of the body can be calculated by calculating the effects of each prism by the ordinary well-known algebraic formulas. Very many of the structures in which the oil geologist or geophysicist is interested have, or may be assumed to have an axis of symmetry. Calculation of the effects on such an axis of symmetry may be very greatly expedited and simplified by the use of graphic charts of a type suggested by the writer. Each chart represents the cross-sections of a series of horizontal prisms at right angles to the plane of the section. Each prism extends to equal distances on either side of the plane of the section and is so constructed that it produces an effect of 1. (2 or 5) E at the origin.

By superposition of the cross section of a body on the graph and counting of the squares under the cross section, the effect of the body at the origin is calculated. A standard series of charts can be constructed with different ratios between the length and depth of the constituent prisms. Calculations of unknown bodies have their limitations; by use of this graphic method of calculation, a series of triangles with a common apex were found, all of which produced the same gradient and differential curvature profile within the accuracy of field observations. The use of this graphical method of analysis on an unknown structure is illustrated by application to the results of Schumann's survey of the Lanzendorf Dome near Vienna. This method of graphical calculation is not adapted for the ordinary terrane calculations or for calculations of effects not on axes of symmetry. -- Author's abstract.

THE USE OF THE TORSION BALANCE IN THE INVESTIGATION OF THE GEOLOGICAL STRUCTURE OF SOUTHWEST PERSIA

By W. F. P. McLintock and J. Phemister

Summary of the Progress of the Geological Survey of Great Britain for 1926. Appendix 2, London, 1927, pp. 168-196.

Two officers of the survey who through the invitation of the Anglo Persian Oil Co. were sent to Persia to investigate the geophysical work of the company have reported their findings in a paper which gives the results of three torsion balance traverses, the interpretation of the results and the success of the torsion balance in indicating the partially known geology, discusses

riefly the theory of the torsion balance and the interpretation of torsion alance surveys, and gives examples of the anomalies produced by different types f geologic structures. A selected bibliography of papers on the torsion alance is appended. It is an excellent and interesting paper. -- Donald C. arton.

A GRAVITY SURVEY OVER THE SWYNNERTON DYKE, YARNFIELD, STAFFORDSHIRE

By W. F. McLintock and J. Phemister

The Mining Magazine, Dec., 1927, pp. 363-365.

A line of torsion balance stations was run across the supposed prolongation of a basalt dike, where the dike was supposed to be covered with glacial rift. The results show the presence of the dike with the clearness of a textook example. -- Donald C. Barton.

THE DETERMINATION OF THE POSITION AND EXTENT OF SIMPLE BODIES BY MEANS OF THE USE OF THE GRADIENT AND DIFFERENTIAL CURVATURE VALUES

By Karl Jung

Ztschr. fuer Geophysik, Jahrg. 3, Heft 6, 1927, pp. 257-280.

Jung reports concisely the results of a mathematical study of the theory f the interpretation of the form and position and size of simple bodies from he form of their gradient and differential curvature profiles as the latter ould be obtained for example by a survey with an Eötvös torsion balance. On ccount of the difficulty of handling the more complicated cases, the study was estricted to bodies (a) of simple cross section, - i.e., horizontal prisms ith vertical or inclined front and back faces - horizontal plates with a vertial or inclined face, cylinders, spheres; (b) of infinite extent at right angles o the plane of the cross section (except for the sphere); (c) of homogeneous ensity in a medium of homogeneous density; (d) where the difference between he density of the body and of the surrounding medium is known. By the use of he relations of the abscissas of the points of algebraic and numeric maximum nd minimum of the gradient and differential curvature, he gives formulas or raphs for the recognition of the presence of those simple forms of bodies and or the determination of their dimensions and of their depths below the surface. e gives also an example of the rough applicability and yet the danger of the se of the formulas in connection with bodies that are not infinite or approxiately infinite at right angles to the plane of the section.

This most interesting paper is a most valuable contribution to the iterature on the theory of the interpretation of torsion balance results. But he applicability of these many formulas will be extremely limited in practice; ost geologic structures are not long enough in reference to their depth to be reated as infinite and are not simple enough to be represented by such simple

cross sections; only a few actual structural situations can be treated as being of homogeneous density in a medium of homogeneous density; the density situation usually can be guessed only very approximately; and, in general, except for structures coming almost to the surface, the abscissas of that distance vary rapidly with a slight change in the ordinates of the value of the gradient or differential curvature near the points of numerical maximum of the gradient or the differential curvature. With the usual complication of the affects of irregularities of lesser and greater order obscuring the situation, the abscissas of the algebraic maxima and minima are extremely indefinite and intangible magnitudes in practice, and the probable error in the determination of the abscissas may be several times the significant differences indicative of the different forms of the bodies and different depths. These formulas will have a very limited applicability in a very rough qualitative determination, for example, of whether a body is half a mile thick and half a mile deep or 2 miles deep and 2 miles thick, but in general will not give accurate enough results to be of practical use. The paper is one which should be studied by students of interpretation but which should be used with great caution in practice. -- Donald C. Barton.

GRAVITY SURVEYING IN GREAT BRITAIN

By H. Shaw

Am. Inst. Min. and Met. Eng., Tech. Pub. 74. Also Geophysical Prospecting, 1929. Am. Inst. Min. and Met. Eng., pp. 530-531.

Shaw gives a brief account of the field operations with the Eötvös torsion balance and the problems of interpreting the results in Great Britain In that country, the balance is used almost entirely to locate ore deposits. These ore deposits are very small in size and many stations have to be taken from 50 to 100 feet apart in order to differentiate the effect of the ore from the effects of small faults, terrane, topography, overburden, and limestone rock. Since the ores are usually located in country where the surface is fairly irregular, great care must be taken in calculating the gravitational effects of the terrane and topography as accurately as possible. When these corrections are made, an isogam map is constructed and from it the effect of the ore deposits can be fairly well distinguished from the effect of the subsurface structure and its dimentions can be calculated with an accuracy sufficient to justify the survey. To calculate effects of these various disturbing elements, it is necessary to know the specific gravity of each.

The gradient is more valuable than the differential curvature in the search for small deposits, because it is not affected by the topographic irregularities as greatly, and therefore can be calculated more accurately with the same amount of work. -- Elizabeth Buhler.

EXPERIMENTS WITH E.T.B. IN THE TRI-STATE ZINC AND LEAD DISTRICT

By P. W. George

Am. Inst. Min. and Met. Eng. Tech. Pub. 65, 1928, 9 pp. Also Geophysical Prospecting 1929. Am. Inst. Min. and Met. Eng., 1929.

In his brief paper, George gives a detailed account of the gravitational esults around Duenweg, the Federal Brewster lease, West Picher, and the estern part of the Federal Jarrett lease. He gives four cross sections and everal tables showing the drilling discoveries; also two gradient maps, one ear Picher and another on the Jarrett lease. From these results, George conludes that under favorable conditions, which he lists, a torsion balance survey n the Tri-State district is very helpful in outlining the silicified and ractured areas, around the edges of which the richest ore bodies are found. -- lizabeth Buhler.

A GRAVITATIONAL SURVEY OVER THE BURIED KELVIN VALLEY AT DRUMRY, NEAR GLASGOW

By W. F. P. McLintock and J. Phemister

Trans. Roy. Soc. Edinburgh, vol. 56, No. 7, Pt. 1, 1928, pp. 141-155.

With an Eötvös torsion balance the mass of rock south of Drumry was apped and calculated to have a slope of 10° on the east side, changing to a lope of $2\frac{1}{2}^{\circ}$ moving westward, at depths corresponding to well data. From both he gravitational map and the well data, a known buried channel was outlined to un north-south on the east side of Drumry with a sharp turn to the east at about ,000 feet north of Drumry.

In making this survey, use was made of Schweydar's method of calculating he terrane effects by the more accurate method of considering the Z^2 terms as ell as the Z terms; and of Lancaster-Jones' method of evaluating topographic ffects from a topographic contour map.

In calculating the types of structures causing such gradients, the arious common formulas are applied. For a first rough approximation to the lope and depth of the structure application was made of Eötvös' formula using sogam intervals. A detailed description is given of Mekel's scheme of combining he derivitives of U_{xz} and $U_{\triangle}$ with respect to $\underline{x}$ with the observed gradient and urvature profiles, to solve for the depth, slope, and thickness, of the inclined dge of a horizontal plate infinite in three directions. -- Elizabeth Buhler.

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THE NEW TYPE OF GRAVIOMETRIC VARIOMETER WITH SHORT PERIODS

By P. M. Nikiforov

Bull. Inst. pract. Geophys., vol. 3, Leningrad, 1927, pp. 308-316.

The large amount of time required for taking readings with the common types of torsion balances and the difficulties in transporting the instruments and outfit are a great disadvantage in their use. Besides, the Russians have repeatedly objected to the use of photographic registrations (Bull. Inst. pr. Geophys., vol. 1, Nikiforov; and vol. 2, Ghirin) and claim they can bring a number of data which show without doubt that readings taken in this manner can not be trusted.

Therefore, a new instrument was designed which is based on a slightly changed principle. This instrument also has the suspending wire, the balance beams, and the hanging weights, but it is not necessary to wait until the beams come to a rest. The position of the equilibrium is rather obtained by measuring the coordinates of the curve resulting from the movements of the beam itself. It then is sufficient to measure only two ordinates; and by not waiting until the beams have come to a rest much time is saved.

The suspending wire can be considerably shortened, and in the new Russian instrument a wire about 2 centimeters long is used. Nevertheless the sensitivity of the instrument is claimed to be about the same as that of the former types; namely, 2×10^{-9} cgs, which is entirely sufficient.

The readings are taken visually, and special care is taken to avoid influences that might come from the body of the observer. The moving of the instrument into another azimuth is made manually; no clock work is employed. To protect the beams against hard knocks a special device was designed. No tent is required except a small and light protecting one in bad weather. The instrument can be easily carried by one man which facilitates the moving to other stations. It is set up upon a tripod instead of a special foot.

The mathematical theory of the instrument was given in a previous paper. The present article contains only a brief description of the instrument. At its end the advantages are summarized, the most important ones of which are as follows: Observation time is considerably shortened, and, therefore, more stations can be perfected per day (20 stations per day and instrument); transportation of instrument is very easy; the short torsion wire is not only much safer against breaks, but also allows the selection of a more uniform and perfect segment; the influences of temperature can be disregarded because of the short observation time; no automatic accessories are employed, and therefore all troubles which may be created by them are avoided; the taking of visual readings also eliminates all trouble with photographic plates; no helpers are needed for carrying accessories, etc.

The new instrument seems to be a remarkable improvement on torsion lances. If the claims against damping and photographic registration are rrect, then also the results should be more accurate. Besides, the consider-le improvement in speed and transportability of the instrument is quite markable. -- E. U. von Buelow.

THE PHYSICAL PRINCIPLES OF THE GRAVITATIONAL METHOD OF PROSPECTING

By P. Nikiforov

Bull. Inst. Pract. Geophys., No. 1, Leningrad, 1925, pp. 153-259;
No. 2, Leningrad, 1926, pp. 232-264.

A very detailed description, illustrated by many diagrams and tables, given of the physical principles of the gravitational method of prospecting.

The contents of the work are: Chapter I, Description and theory of the rsion balance. Potential of gravity: (1) Application of the principle of the rsion balance for the determination of the elements of the gravitational field;) description of a torsion balance (Eötvös and that constructed in the ysico-Mathematic Institute of the Russian Academy of Sciences); (3) forces ting on the instrument; (4) differential equation of the proper movement; (5) e general integral of the equation; (6) the determination of the state of uilibrium of the torsion balance; (7) an example; (8) determination of the cond derivatives of the potential of gravity by means of a graviometric vario-ter; (9) an example; (10) determination of constants; (11) an example.

Chapter 2, Geodetic and physical meaning of the second derivatives of the tential of gravity. Normal values, local effects and perturbations. (1) Some roperties of the potential of gravity; (2) gradients of gravity along the rizontal coordinate axes; (3) changes of g; (4) the deviation of the level sur-ce from the spheric form and the azimuths of the principal normal sections;) normal values, local effects, and perturbations of the second derivatives the potential of gravity; (6) normal values (tables with values for latitudes from 40° to 65°); (7) general expressions for perturbations of the second rivatives; (8) local effects, Eötvös formulas; (9-15) Nikiforov's formulas r the calculation of local effects; (16) cartographic effects; (17) Belov's apho-analytical method of calculating local effects.

Chapter 3, Interpretation of the results of observations. Case of bodies regular geometric form. Direct and inverse problem of geophysics. (1) The oblem; (2) the case of a homogeneous sphere; (3) the case of a homogeneous rcular cylinder; (4) the case of a horizontal layer; (5) sensitiveness of the thod; (6) the case of an infinitely long horizontal layer of a rectangular ape; (7-8) the case of an inclined layer; (9) a system of parallel, inclined yers of various density; (10) the direct and inverse problem of geophysics.

Chapter 4, The interpretation of the results of observations on the basi of the values of the gradients of the horizontal components of attraction. (1) The case of a homogeneous sphere; (2) the case of a homogeneous circular cylinde lying horizontally; (3) the case of an infinitely long horizontal layer of a rectangular shape; (4) a system of parallel, inclined layers of various density.

Chapter 5, The determination of local effects and perturbances using the Hutton-Hayford's graphical method. (1) The application of the method; (2) the determination of the local and cartographic influences; (3) the determination of the influence of the subterranean masses. -- Ayvazoglou.

A SIMPLIFIED METHOD OF THE CALCULATION OF THE ZERO POINT OF A TORSION BALANCE

By P. Nikiforov

Bull. Inst. Pract. Geophys., No. 2. Leningrad, 1926, pp. 203-231.

A method based on the general formulas of the damping of the oscillating movements of a gravitational variometer is described. Elaboration of observations made on a large scale with the gravitational variometer has proved that V (damping coefficient) depends on the resistance of the air and the elastic property of the torsion filament and remains constant not only for the same series of oscillations in a given azimuth of the beam but also for all series of oscillations in different azimuths. Supposing V constant, simplified equations for V, A_k (successive amplitudes of the curve) and Y_o (ordinate by which the state of equilibrium is characterized) are derived.

An example for calculations of Y_o for one series of oscillations based on the measured values of Z_k (ordinates of successive maxima and minima of the curve) is given.

If the value of V for a given instrument changes in the course of time, this can be noticed immediately by the fact that the individual values of Y_o do not remain constant in the given series of oscillations, but decline consequently from the mean value.

The necessary change of V for obtaining correct results may be determine easily.

For calculations according to this method, tables for the values of A_k, for changes of $\Delta Z = Z_k - Z_{k+1}$ and V are arranged by Prof. A. V. Terentiev and added to this article. -- W. Ayvazoglou.

A METHOD OF RAPID CALCULATION OF THE VECTORS OF THE EÖTVÖS DIFFERENTIAL CURVATURE IN THE CASE OF A SLOPING STRATUM

By K. A. Kirillov

Bull. Inst. Pract. Geophys., No. 2, Leningrad, 1926, pp. 265-269.

Tables and graphs are given from which the values of the vectors of the Eötvös differential curvature in the case of a sloping stratum may be calculated. The article is written with reference to Nikiforov's work, "The Physical Principles of the Gravitational Method of Prospecting." -- W. Ayvazoglou.

THE GREATEST POSSIBLE DEVIATION OF THE INTENSITY OF GRAVITY AND THE DENSITY OF THE CLOSE-MESHED NET OF PENDULUM STATIONS

By Karl Jung

Ztschr. fuer Geophysik, Jahrg. 3, Heft 4, 1927, pp. 137-157.

The fact that the pendulum measurements performed by Berroth above the salt bed in Oldan-Hambühren have proved the possibility of an accurate prospecting of the terrane by means of a close-meshed net of pendulum stations induced the author to give a mathematical solution of this question.

The disposition of the work in the article:

A. The problem. B. Theoretical investigations: (1) Definition and simplified assumptions; (2) mathematical disposition, definition of the variation problem; (3) solution of the variation problem; (4) remarks on the elimination of some simplified assumptions. C. Numerical considerations with regard to their practical application: (1) The greatest possible deviation of the intensity of gravity; (2) the density of the close-meshed net of pendulum stations; (3) justification of the most essential simplified assumptions; (4) examples.

The calculations are illustrated by seven diagrams. -- W. Ayvazoglou.

THE DEPENDENCE OF THE GRAVITATIONAL EFFECT ON THE INTERMEDIATE LAYERS

By T. Schlomka

Ztschr. fuer Geophysik, Jahrg. 3, Heft 8, 1927, pp. 397-400.

The author tries to establish by experiments the existence of the "Refraction of the gravitational lines of forces," as most of the previous theoretical and experimental researches on the dependence of the gravitational effect on the intermediate layers were based on the "absorption of this effect." The arrangement of the experiment (shown in a diagram) and the procedure for it

is explained. For effectuating the gravitation, the author used an iron block of about 1,200 kilograms; the intermediate layer was water (about 825 liters) filling a sheet-iron box of the shape of an isosceles triangle (base = 100 centimeters, opposite angle 37.5°, height 112 centimeters). Measurements were performed by the Eötvös torsion balance and a table of data obtained by a series of experiments is given. Although very accurate absolute values of the effect could not be obtained, the existence of the refraction was confirmed. The author expects to take up the experiments again as soon as all precautions necessary for obtaining accurate data are accomplished. — Ayvazoglou.

ILLUSTRATION OF THE PERIODS OBSERVED, AS WELL AS OF THEIR ACCURACY
(With 9 diagrams)

By J. Bartels

Ztschr. fuer Geophysik, Jahrg. 3, Heft 8, 1927, pp. 389-397.

The author proposes for the illustration and comparison of geophysical periods of equal length a simple form of vector diagram by which the amplitude as well as the occurrence of the maximum is shown. Several examples by which the utilization of this "period watch" is shown are discussed in the article and formulas for the estimation of errors in periods observed derived. The graphic representation of the accuracy is made by using the limits of the error obtained by calculations. The contents of the article are arranged as follows: (1) The reason why the use of the period watch shall be preferred to other methods; (2) calculations concerning the arrangement of the period watch; (3) examples given with regard to observations made in different places; (4) determination of errors; (5) relation to periodograms; (6) application illustrated by further examples and diagrams. — W. Ayvazoglou.

A GRADUATED PLATE (PALLET) FOR MEASURING THE ZERO POINT POSITION OF A TORSION BALANCE

By S. Ghirin

Bull. Inst. Pract. Geophys., No. 3, Leningrad, 1927, pp. 317-322.

The determination of the zero-point position in the gravitation variometer with uninterrupted registering of the oscillation of the scale-beam requires computation. The present article offers a method of determination of the required equilibrated position of the scale-beam by means of a special plate (pallet) excluding the necessity of any calculation.

The construction of the graduated plate is carried out according to mathematical calculations obtained from the equation of the oscillations of the scale-beam as they die away. Both branches of the curve are laid out on a glass

plate on which a graduated scale is set. A figure given in the article shows the pallet and the superposed curves of registration given by the apparatus. Checking by means of the graduated plate of the accuracy of reading as compared with other methods has given favorable results. -- W. Ayvazoglou.

2 - MAGNETIC METHODS

ARKANSAS MAGNETOMETER STUDY RESULTS: INSPECTION OF PLATES SHOWS SEVERAL PRONOUNCED HIGHS AND LOWS, FAVORABLE AREAS FOR GAS AND OIL SEARCH

By L. Spraragen

Oil and Gas Jour., vol. 27, No. 36, Jan. 24, 1929, pp. 30, 95; vol. 27, No. 39, Feb. 14, 1929, pp. 42, 110.

The observations of the vertical intensity of magnetism made by the United States Coast and Geodetic survey are taken as the basis of the Arkansas Magnetometer study and are corrected for latitude and longitude. Isogams are drawn, both on the corrected and incorrected values. An attempt is made to show some connection between the magnetic highs and lows of those maps and the oil possibilities of the state as outlined by Branner.

Although the isogams of plate 2 are suggestive as outlining the eastern and southern edge of the Paleozoics, the net of stations is far too sparse for a study of this type to have any appreciable value for the oilman. -- Donald C. Barton.

MAGNETOMETER STUDY OF STATE OF TEXAS, METHOD OF GEOPHYSICAL EXPLORATION BEING USED EXTENSIVELY IN WEST TEXAS, PANHANDLE, AND RED RIVER UPLIFT

By L. Spraragen

The Oil Weekly, vol. 27, No. 31, Dec. 20, 1928, pp. 25, 74-76; vol. 27, No. 33, Jan. 3, 1929, pp. 34, 76, 102.

The scattered net of observations of the vertical magnetic intensity taken by the United States Coast and Geodetic Survey, mostly at county seats, have been used as the basis of the study. The values have been corrected for latitude and longitude and isogams have been drawn both on the corrected and incorrected values. A net of cross profiles has been plotted. Conclusions are expressed in regard to the significance of some of the magnetic anomalies of the map, and the conclusion is stated that certain large features such as faults and ridges - for example, the Mexia fault - can be traced with the magnetometer.

Although a study of this type does reveal certain relations and although it is of value in the hands of an expert geologist - geophysicist - who is aware of its extremely serious limitations, it is extremely and seriously

dangerous. The net of stations is too wide to allow the drawing of such conclusions as have been drawn; as a geologist and geophysicist, the reviewer can not accept many of these conclusions. -- Donald C. Barton.

NEW CALIBRATING DEVICE AIDS WORK WITH THE MAGNETOMETER

By L. Spraragen

Oil and Gas Jour., vol. 27, No. 40, Feb. 21, 1929, p. 118.

A calibrated coil is used to set an electromagnetic field of controlled strength. The device consists of the calibrated coil and an instrument panel with an ammeter, potentiometer, a set of resistances, switch, and 2 dry cell batteries. The coil is so designed to fit around the magnetometer. -- Donald C. Barton.

MAGNETIC MICROLEVELLING CARRIED OUT IN THE IRON ORE DISTRICT OF LIPETZK IN 1925

By E. Krakau, N. Malinine, and M. Penkevicz

Bull. Inst. Pract. Geophys., No. 2, Leningrad, 1926, pp. 83-95.

The authors occupied 237 stations with Brunner-Chasselon magnetic thedolites and Dover dipcircles. The tables annexed at the end of the report contain numerical data concerning the results of observation. -- Donald C. Barton.

THE MAGNETIC OBSERVATORY IN THE COAL BASIN OF THE DON AND THE MAGNETIC SURVEY NEAR MAKEYEVKA

By J. Bahurin

Bull. Inst. Pract. Geophys., No. 2, Leningrad, 1926, pp. 96-106.

The Institute of Practical Geophysics suggests the importance of a magnetic observatory in the Don coal basin for the registration of the variation of magnetic declination in connection with mine surveying and for geophysical prospecting in the southern part of the Union of Socialist Soviet Republics. -- Donald C. Barton.

MAGNETIC OBSERVATIONS IN THE REGION OF THE COAL FIELDS OF THE BASIN OF THE DON (DISTRICT OF THE VILLAGE OF MAKEYEVKA)

By N. Rose

Bull. Inst. Pract. Geophys., No. 2, Leningrad, 1926, pp. 107-123.

Observations were made for the purpose of selecting a suitable site for the magnetic observatory. -- Donald C. Barton.

THE WORK OF THE INSTITUTE OF PRACTICAL GEOPHYSICS ON THE BROWN IRON ORE DEPOSITS (OF THE TULA AND LIPETZK DISTRICTS)

By J. Bahurin

Bull. Inst. Pract. Geophys., No. 2, Leningrad, 1926, pp. 65-82.

Bahurin's paper gives the results of magnetic surveys of iron ore deposits in the Tula and Lipetzk districts, with three maps. Although most of the anomalous vectors only slightly exceed the probable error of observation, a few are considerably larger and seem to correlate with the ore deposits. In one area of the Lipetzk district the anomaly in the inclination amounted to 20 feet and the anomaly of horizontal intensity amounted to 250 gamma. In the Tula district the anomaly in the inclination was 34 feet, in the horizontal intensity 180 gamma, and in the vertical intensity 500 gamma. -- Donald C. Barton.

THE NEW MAGNETIC UNIVERSAL BALANCE

By H. Haalck

Ztschr. fuer Geophysik, Jahrg. 3, Heft 2/3, 1927, pp. 58-68.

A new instrument is described by which the local variations of the three components (declination, horizontal intensity, and vertical intensity) of the earth magnetic field may be determined in a simple and quick way with an accuracy answering that of Schmidt's field balance used for measurements of the vertical intensity.

A detailed description of the instrument, accompanied with a few schematic pictures, and a brief discussion of the theory of the instrument are given. (The detailed discussion of this theory may be found in H. Haalck's work "Ein neues erdmagnetisches Universalvariometer, Zeitschrift fuer Instrumentenkunde, 1927, Heft 1).

The procedure for the observation work: (a) Measurement of the vertical intensity; (b) measurement of the declination; (c) measurement of the horizontal intensity; (d) determination of the constants of the instrument and of the temperature coefficients; (e) observations and calculations (forms of observation and calculation schemes are given).

According to the author one complete measurement, inclusive of the adjustment of the instrument, by an observer more or less familiar with the work, requires from 20 to 25 minutes.

The instrument has proved to be satisfactory for measurements of weak as well as strong earth magnetic variations. (The instrument is manufactured by the Exploration G. M. b. H. Berlin, Linkstrasse 25). -- W. Ayvazoglou.

3 - SEISMIC METHODS

THE SEISMIC METHOD OF MAPPING GEOLOGIC STRUCTURE

By Donald C. Barton

Geophysical Prospecting, 1929. Am. Inst. Min. and Met. Eng., 1929, pp. 572-624.

The velocity of transmission of the elastic earth waves ranges from 2.0± kilometers per second in Pho. Pleistocene sediments in the Gulf Coast area to 5.0± kilometers per second in the salt. From the point of an artificial explosion at the surface, the wave front travels radially in all directions through the surrounding formations. If a formation with a higher speed of transmission of the waves is present in the subsurface, the elastic waves are (a) reflected directly back to the surface or (b) refracted along the upper surface of the formation and then re-refracted back to the surface. By observation of the time of arrival of the "surface" and reflected waves, the depth to the top of high speed formation may be calculated. By observation of the time of arrival of the "surface" and refracted waves and by construction of time-distance curves, and by proper location of stations, the speed of transmission of the waves in both formations, the depth to the top of the lower (high speed) formation, the depth of the top of that formation, and the lateral limits of that lower formation can be calculated. The mathematical formulas are developed for the case in which each formation is isotropic and homogeneous. The method may be used in reconnaissance for salt domes, in detailing salt domes, and in mapping various types of geologic structure. Crooked drill holes may be mapped by the electric types of seismographs. The seismographs used are mostly of two types; photographically recording mechanical seismographs and photographically recording electric-induction seismographs. The time of the explosion is obtained by wireless, and in reconnaissance for salt domes the distance between shot and receiver is obtained by use of the travel time of the air waves. Charges range from a few to many hundred pounds of 60 per cent dynamite, dependent on the type of work and the local conditions of terrane and wind. The shot lengths range, in general, from 500 feet to 8 miles. In reconnaissance for salt domes, "fan" shooting is used; in most of the other type of work, profile shooting is used. A seismic troop usually consists of one firing unit and three or four receiving units. The cost of seismic work ranges from $10,000 to $20,000 per month. In reconnaissance for salt domes, 150,000 to 300,000 acres per month can be covered. The results of seismic prospecting in the Gulf Coast area have been most brilliant. In comparison to 42 old known domes, 21 domes have been discovered

by the seismograph and proved by drilling and 27 domes have been discovered and now yet tested. Oil fields have been found on six of the 21 domes. In East Texas, 11 new domes were discovered and of those five have been proved by drilling. About 30 seismograph troops are operating in United States and Mexico. -- Author's abstract.

SOUTH LOUISIANA HAS REAL FUTURE IN NEWLY FOUND DOMES

By Jack Logan

The Oil Weekly, vol. 52, No. 7, Feb. 1, 1929, p. 84.

Logan gives a brief review of the results of geophysical prospecting and subsequent drilling in southern Louisiana. Of the 80 wells being drilled, 19 are on "geophysical" domes. Of the "geophysical" domes, 3 have been proved commercially productive, 2 have a little oil, 6 have been drilled without finding oil as yet, and 19 are untested. -- Donald C. Barton.

HOME OF "GATOR" AND WATER LILY OPENED FOR OIL BY SCIENCE, "DYNAMITE BUGGY" AND PIROGUE ARE TOOLS WITH WHICH WILDCATTERS SEEK DOMES IN LOUISIANA SWAMPS

By Wallace Davis

The Oil Weekly, vol. 52, No. 27, Feb. 1, 1929, pp. 69-76.

A popular account of field practice with the seismic method in the Louisiana swamps, illustrated by many interesting photographs of characteristic phases of the work. -- Donald C. Barton.

THE SEISMOGRAPH IN THE GULF COAST

By Mark C. Malamphy

The Oil Weekly, vol. 52, No. 5, Jan. 18, 1929, pp. 31-34.

An excellent succinct popular statement of the seismic method of prospecting for salt domes as it is actually used in the Gulf Coast. The paper is illustrated with a characteristic "shot" map and with time-distance curves. -- Donald C. Barton.

SEISMIC EXPERIMENTS WITH EXPLOSIONS; PRELIMINARY NOTE

By P. M. Nikiforov

C.R.Acad.Sci.de l'U.S.S.R.,Ser.A, Leningrad, Oct., 1926, pp. 189-190.

The author briefly reports experiments carried on with various seismographs employing (1) a vertical seismograph of B. B. Galitzin, slightly changed for this special work: (2) the horizontal seismograph by Wiechert-Mintrop: (3) a small horizontal seismograph of their own design. Problems studied are defined, results obtained will be given in a separate paper at an early date. -- E. U. Von Buelow.

4 - ELECTRICAL METHODS

BASIS FOR CALCULATING THE OBSERVATIONS OF EARTH CURRENTS

By A. Petrowsky

Bull. Inst. Pract. Geophys., No. 2, Leningrad, 1926, pp. 124-142.

A continuation of Petrowsky's previous paper "The Theory of Earth's Current Measurement," in which the mathematical expression was deduced for the potential in the zone surrounding a spherical electrode half sunk in the ground, and gives an analysis of that formula and a method for its application to the distribution of the field within the medium according to the deviation of a galvanometer included in the circuit between a pair of such electrodes. The observations in the fields at Ridder's mine("Electrometric Methods of Ore Prospecting and Experimental Investigation at Ridder's Mine during Summer of 1924." The abstracts of these two articles are given in Geophysical Abstracts No. 1.) confirmed the theoretical deductions. -- Donald C. Barton.

ELECTRICAL METHODS OF PROSPECTING

By J. B. Mawdsley

British Columbia Miner, vol. 2, 1929, pp. 21-27.

The general principles underlying the self-potential, equipotential and electromagnetic methods are discussed. The cost of electrical surveying and the recent work of the Canadian Geological Survey are briefly dealt with. The paper is of a general type. -- D. A. Keys.

ELECTRICAL PROSPECTING BY MEANS OF ALTERNATING CURRENT
(With 8 Diagrams)

By Richard Amoronn

Gerlands Beiträge zur Geophysik, Band 19, Heft 1, 1928, pp. 5-58.

In investigations of the distribution of electric conductivity in the bsoil by means of alternating current, more particularly for the purpose of e geophysical location of minerals, salt-water horizons, and so forth, due nsideration has not hitherto been given to the elliptic polarisation of the ltage, current, and magnetic field vectors, which was first recognized and ed in field work by the author. The electromagnetic vectors of such a dis-ibution of alternate currents in space describe plane ellipses of the fre-ency of the exciting field, the quantitative measurement and representation which alone reproduce a complete and unambiguous picture of the whole enomenon.

Such a complete measurement and representation of the electromagnetic eld of the earth currents is possible by means of several systems of observa-onal data. One may utilize either the plan of the ellipse, the magnitude d direction of the axes and the phase of one diameter, or one may define the ane of the vibration ellipse by means of the amplitudes and phases of three near vibration-components not lying in a common plane.

Various combined methods are also suitable, both for practical deter-nations in the field and also for a clearly understandable, graphic represent-ion of the results. The formulas for the calculation of various systems of is kind are derived in the article.

The vibration ellipse completely represents the phenomenon in time and ace at any given point of observation, whilst the momentary fields, calculated r a definite and suitably chosen time - phase - give a clear view of the ructure of the field at any such time.

By vectorially subtracting from the field so measured, the normal field ich would have been obtained above a homogeneous subsoil, one obtains a rived, elliptically polarized field of disturbance in which the influence of e required electromagnetic anomalies in the subsoil is sharply defined. For is field of disturbance the momentary fields at suitably chosen times can also calculated and diagrammatically represented, so that they may be individually alyzed.

On comparing this perfected process with those methods of electric vestigation of the subsoil which have hitherto been used, it will be seen at heretofore only very crude determinations have been obtained, which are, fact, usually quite erroneous physically, as the directions characterized as ines of force" are not even lying in the plane of the true vibration ellipses. is only by taking into account the elliptic polarization of the electro-gnetic field of the earth currents that it is possible to carry out a scienti-cally accurate investigation of the subsoil by alternating current. -- thor's Abstract.

WHEN AND WHERE SHALL THE ELECTRICAL METHOD OF PROSPECTING BE USED?

By Ingemar Tennberg.

Berg und Hüttenmännisches Jahrbuch, Band 76, Heft 2, Wien, 1928.

The author discusses the question why so many persons interested in exploration of ore deposits are not enthusiastic about the electrical method of prospecting, notwithstanding the fact that ore deposits have already been found by using this method. In his opinion, this distrust may be explained in the first place by the fact that the prospecting is often performed by persons and firms who do not know much about geophysics. But even in case of prospecting substantial firms, the mine owners are often not satisfied with the results, as they expect too much.

The work of a geophysicist can not be compared with that of a bridge constructor or a surveyor of mines, as the latter two work with known qualities whereas the solution of the problem assigned to a geophysicist depends mostly on his theoretical knowledge of the question and his personal ability.

In most cases the possibility of the solution can not be determined in advance.

The first supposition for a successful electric prospecting is that of a sufficient difference in conductivity between the ore body sought for and the bodies surrounding it. How great the ratio of conductivity shall be is at present a question discussed by the two adepts of the geophysic science, Ambronn and Koenigsberger.

The following ores are considered to be the most suitable for electric prospecting: Galena, chalcopyrites, bornite, sulphur-pyrites, magnetic pyrites, arsenic pyrites, arsenical pyrites, gray copper ore, some heavy metal sulphates and all precious and semiprecious metals. The specific resistance of pure metals is between 100 ohms and a fraction of one ohm per cubic cm. The resistance of ore bodies lying close to the surface of the earth seldom has values smaller than 3,000 ohms per cubic centimeter. Thus a ratio of the conductivity of the rocks and that of the ore of from 1/30 upward may be adapted. A certain minimum dimension and maximum depth should also be established, as the ratio of the conductivity depends on them. According to the opinion of the author, an ore body with a ratio of at least 1/1,000, lying at a depth half as great as its length, can be determined from the surface of the earth with certainty. The minimum length of the ore body should be, according to experience, from 15 to 20 meters. In case of larger ore bodies or very small depths, the ore may be found if the ratio of conductivity is even smaller. But as the ores are mostly found disseminated in dead rocks, the determination of the ratio of conductivity is difficult, thus the possibility of solving the problem can not be decided in advance. In addition to the cardinal points such as: Ratio of conductivity, dimension, depth, and the influence of the distribution of the parts of the ore

body, a certain importance for electrical prospecting must also be assigned to the absolute values of the conductivity of the ore bodies and rocks. In case of specific resistance of rocks smaller than from 4,000 to 5,000 ohms per cubic centimeter, complications in using the ordinary alternating current process may occur which can be overcome only with the aid of the most modern technical means, available only to the firms equipped the best. In conclusion, the author recommends the use of the geo-electrical method of prospecting, by all means, in places in which large sulphide compact ore bodies (except the pure zinc-blende) are deposited in eruptive rocks or crystalline schists. In case of sedimentary rocks exhibiting only a slight metamorphism or not metamorphic at all, the task is more difficult but may be accomplished by organizations equipped with the best scientific means. Gangue deposits must be considered unfavorable objects. Single small lenses can be discovered only if they are connected one with another so that a continuous electric conductor is formed. Only occasional results may be obtained with impregnated ores, the parts of which are bedded inside of isolating masses. As far as the preference, in connection with sensitiveness of one or the other method is concerned, the author's opinion is that a method by which the material observed may be utilized in the most logical and mathematical way should be chosen. -- W. Ayvazoglou.

5 - RADIOACTIVE METHODS

ON HIGHLY PENETRATING EARTH RAYS

By L. Bogoyavlensky

Bull. Inst. Pract. Geophys., No. 2, Leningrad, 1926, pp. 184-195.

Ninety stations in the Caucasus were occupied over an area of 10,500 square meters of radium deposits in fissures in travertine. The curves of equal intensity were elongated in the same direction as the fissures. The intensity measured seemed to be constant within 3 per cent, no matter whether the observations were taken a year apart or under different meteorological conditions. At 2 of the stations the radiations were absorbed by lead screens 1 centimeter thick. The presence of radiation of greater penetrating power than the gamma rays of radium C were indicated. The effect of the radioactivity of the air was nil and of the upper soil negligible. -- Donald C. Barton.

MEASUREMENTS OF RADIOACTIVITY AS A GEOPHYSICAL METHOD OF PROSPECTING

By Ferdinand Müller

Ztschr. fuer Geophysik, Jahrg. 3, Heft 7, 1927, pp. 330-336.

The enrichment of radioactive substances occurs under certain geological conditions. In Müller's article the steps necessary for the determination of these enrichments are described and some examples of the application given. The following problems are examined:

A. Preparatory facts. The author mentions the literature concerning the researches and distribution of radioactive substances in minerals, rocks, waters of all kind, atmosphere, and soil. According to this distribution, there are two main kinds of problems of radioactive measurements with regard to geophysical prospecting; the first consists of discovering the active minerals and sources and of the determination of the amount and kind of the acting constituent; the second, of the solution of special geological questions in connection with the radioactive enrichment.

B. Methods of investigation: (1) Ambronn's method; (2) Bogoyavlensky's method; (3) Koenigsberger's improvement on Ambronn's method; (4) method by which the emanation content of the soil gases is determined by introduction of them into the ionization chamber by means of a pump; (5) measurements of emanation by means of fontactoscopes or fontactometers; (6) method of comparison of test pieces taken from place to place.

C. Practical examples concerning the use of one or the other method with diagrams of places in which investigations were made are given in the article. The author adds besides some observations of his own during his practical research work on behalf of the Elbof-Piepmeyer Co. -- W. Ayvazoglou.

RADIOMETRIC EXPLORATION OF OIL DEPOSITS

By L. N. Bogoyavlensky

Bull. Inst. Pract. Geophys., No. 3, Leningrad, 1927, pp. 113-124.

Based on the results of the study of emanations of the earth, the author performed experiments in the oil deposits of the Maikop district (Province of Kuban) in order to verify his supposition that an extremely slight change of radium content in ores influences the intensity of penetrating radiation and that the radioactivity of an oil bed must differ from that of the strata surrounding it, on the following grounds: (1) Oil, being an organic compound, possesses an immense power of absorption of radioactive emanations; and (2) the strata underlying the oil bed, having been developed from repositories of sea-ooze, are richer in radium because of the greater power of absorption peculiar to colloids. The data obtained from the experiments, illustrated by the diagrams of sections and intensities, proving the correctness of his supposition, are given in the article. -- W. Ayvazoglou.

MEASUREMENT OF THE CONTENT OF RADIUM EMANATIONS IN THE ATMOSPHERIC AIR

By A. Domakin

Bull. Inst. Pract. Geophys., No. 3, Leningrad, 1927, pp. 124-136.

The author describes the measurement of radium emanations in the atmospheric air, using the aspiration method, by means of blowing the tested air through a cylindrical condenser. A scheme of measurements based on theoretical

calculations and a diagram is given. A special type of field installation arranged for this purpose is described; the construction of the apparatus is given schematically. In order to obtain the necessary intensity an automobile magneto has been used. The consumption of the air was increased up to 70 liters per second (only from 3 to 8 liters per second in previously known field installations), thus the time required for a full measurement was reduced from the usual two to three hours to 30 to 40 mimites. The records of values obtained by measurements in Leningrad and in Piatigorsk (Caucasus) are given in a table. -- W. Ayvazoglou.

EXPERIMENTS ON RADIATIONS PENETRATING THROUGH THE CRUST OF THE EARTH

By L. N. Bogoyavlensky and A. A. Lomakin

Bull. Inst. Pract. Geophys., No. 3, Leningrad, 1927, pp. 87-111.

Disposition of the work: (1) Apparatus used; (2) place of experiments; (3) constancy of the tension of the penetrating radiation (tables showing data of observations made during three continuous years); (4) influence of the radioactivity of the atmosphere; (5) influence of cosmic radiation coming from above; (6) influence of the radioactivity of the upper stratum of the soil (diagrams and tables with data of observations at different points using hoods and filters of different thickness); (7) calculation of the coefficient of absorption with formulas and tables showing this absorption for hoods and filters; (8) calculation of the length of the wave.

The experiments were performed in Piatigorsk (Caucasus) by means of a portable electometer covered with lead 1 centimeter thick. The measurement proved that by using the same apparatus the intensity varied greatly, depending on the stations of observation. These variations of intensity were especially marked in places rich in radium, where divergences of about 100 per cent were sometimes observed between stations separated one from another by a few meters only. Measurements made at the same stations of observation during a period of three years have shown that the intensity was constant and independent of meteorological conditions. The content of radio elements in the upper layer of the soil was proved by the measurements to be constant, thus the variations were due to deeper strata only. Four hoods, fitting one into another, 2 centimeters thick each, were used for covering the apparatus from above and from the sides, and four flat lead screens (filters) were used for protecting the apparatus from beneath; the experiments have proved that the influence of the hoods was very slight only and that of the filters important, thus testifying that the electrometer was influenced chiefly from below. The coefficient of absorption was calculated by varying the thickness of the lead protecting the apparatus, from 0 centimeter to 8 centimeters. The coefficients of absorption by filters varied from 0.45 to 0.06 for 1 centimeter. In most cases the coefficient of absorption decreased with the increase of the thickness of the lead. -- W. Ayvazoglou.

6 - GEOTHERMAL METHODS

By J. Joly

Gerlands Beiträge zur Geophysik, Band 19, Heft 4, Leipzig, 1928, pp. 415-441.

After a short historical introduction the following matters are dealt with: The nature and structure of the continents; the distribution of radioactivity in the earth's surface structure; the thickness of the continents as estimated on isostatic grounds; the distribution of temperature in the continents; seismic evidence as to the earth's surface structure; the probable origin of the surface structure; the thermodynamics of a revolution are specially dwelt on and a paper "On the Thermal Instability of the Earth's Crust" by H. H. Poole and J. H. J. Poole is quoted, in which the recent accessions to our knowledge of the physical properties of rocks are applied to the views of Lord Kelvin and the conclusion is reached that cyclical discharge of radioactive heat must occur.

There follows a reference to the intervention of tidal movements in the discharge of collected heat. An abstract of a mathematical paper by Cotter, "On the Escape of Heat from the Earth's Crust," is succeeded by an estimate of the rate of thermal genesis in the substratum. The stability of the ocean floor is referred to, and finally there is a note on the experimental reproduction of cyclical thermal system. -- Author's Abstract.

7 - UNCLASSIFIED METHODS

AFTER DEEP DOMES WHAT?

By John F. Weinzierl

The Oil Weekly, vol. 52, No. 8, Feb. 8, 1929, p. 34.

The change in emphasis on the seismic method back to the torsion balance in the Gulf Coast area is mentioned. The opinion is expressed that a framework of detailed pendulum observations is necessary to explain the deeper tectonics. -- Donald C. Barton.

METHODS OF APPLIED GEOPHYSICS FOR THE EXPLORATION OF OIL, ORES, AND OTHER USEFUL DEPOSITS

By Erich Pautsch

Published privately by the author, Houston, Tex., 1927, 82 pages; numerous diagrams.

In the few pages of this small book Pautsch covers: (1) The methods and tasks of applied geophysics; (2) the gravitational method, giving a brief discussion of the elements of the theory of gravitation and a more extended discussion of the theory of the Eötvös torsion balance method with some of the more

asic formulas and profiles of the gradient and differential curvature produced y different types of bodies; (3) the seismic and acoustic methods, a discussion rincipally of the theoretical principles of (pure rather than applied) eimology and with an inadequate description of the instruments actually in use; 4) the magnetic method, theory and instruments, a very brief description and iscussion; (5) the electric methods, a brief history of the use of electric ethods and a discussion of the galvanometric method, the inductive method, the heory and description of the current in the earth method, resistance of some onducting bodies method, the (wireless) wave method, the capacity method, and he polarization method.

The discussions are so condensed and brief that the beginner will doubtully follow and understand the discussion, and the advanced student of geohysics will not find it of much use. -- Donald C. Barton.

ELEMENTS OF GEOPHYSICS, AS APPLIED TO EXPLORATIONS FOR MINERALS, OIL AND GAS

By Richard Ambronn (M. C. Cobb, translator)

72 pp., 84 figs., 1,672 refs. Translated from "Methoden der Angewandten Geohysik," Liesegangs Wissenschaftliche Forschungsberichte, Naturwissenschaftliche eiche, Band 15, Theodor Steinkopf, Dresden and Leipzig, 1926. McGraw Hill Book Co., New York, 1928.

The purpose of the book is not to serve as a textbook for the execution f geophysical surveys but is, first, to provide a complete and well-balanced eview of all the geophysical methods that may be used in economic geology, so hat the geologist, mining engineer, layman, or executive who has to do with hem or is considering the use of them, may come as completely as possible to nderstand their possibilities and applicabilities; and, second, to provide for he practical geophysicists and others interested in applied geophysics, refernce to the thought and literature on the subject.

The book comprises an introductory chapter on the development and resent position of geophysical methods in prospecting; influence of the suburface formations on the character of the gravitational field at the surface f the earth, including pendulum and torsion-balance surveys; magnetic methods f investigations; the use of radioactive and atmospheric-electric measurements or geophysical prospecting; electrical methods of prospecting in the earth's nterior; and the use of temperature methods in applied geophysics.

Under each subject the elements of the pure as well as the applied heory are given, the geophysical instruments and their method of use are escribed, the results of many applied geophysical surveys are shown, and practically all published descriptions of geophysical surveys are mentioned. The iterature on geophysics apparently has been thoroughly searched and a detailed eview is given of the pertinent thoughts, theories, suggestions, observations, ata, and at the point of mention, direct references are made to the literature. here are 84 diagrams, sections, and maps and a bibliography of 1,672 articles rom 277 serials.

The portions of the manuscript checked against the original by the reviewer were found faithfully to follow the German text. Minor revision and small additions of new material were made in a few places in the book by Ambron during the translation, but in general the book is as of the date of the original, March, 1926, and the extensive literature of 1926, 1927, and first half of 1928 is not mentioned or listed. The typography is good and the illustrations clear.

The only adverse criticism which the reviewer has to offer is that in some places not sufficient distinction is made between practically untried methods which theoretically should work and methods which have actually been proved successful. The general impression which the book gives in regard to the successful applicability of the methods in economic geology is slightly too optimistic. The book also would have been more convenient in many ways if it had been pocket-sized like the German original.

If the reviewer were allowed only one book on geophysics he would have to choose this. It will be the indispensable reference book of the professional geophysicist and the textbook of the elementary and advanced students of geophysics and of geologists, executives, and others interested in applied geophysics. — Donald C. Barton.

APPLIED GEOPHYSICAL METHODS IN AMERICA

By Donald C. Barton

Economic Geology, vol. 22, No. 7, November, 1927, pp. 609 to 668.

The methods of applied geophysics in practical use in economic geology in America are largely foreign-born. The redeeming feature to an American is the way that they have been taken up by the American oil companies. The methods in considerable practcal use are four - the Eötvös gravimetric, the seismic, the electric, and the magnetic. The Eötvös gravimetric method was developed by Baron Eötvos of Hungary during the latter part of the past century. The seismic method was worked out by Fessenden of the United States in 1913, but in its present development is due largely to a later but independent development of the method by Mintrop of Germany. The application of electric methods to prospecting has been the subject of experimentation for nearly a century; the recent successful developments of practical instruments and technique for commercial application of the methods was by Lundberg and Nathorst in Sweden, Schlumberger in France, Gella in Austria, and Sundberg in Sweden. The magnetic method has been in practical use for over half a century in connection with magnetic iron ores. The present application of the method to faintly magnetic ores and to geologic structure dates from the recent invention by Schmidt of Berlin of his adaptation of the Lloyd balance (British) and from Schuh's mapping of the Lübteen salt dome in Germany with a Schmidt-Lloyd balance. These methods have been taken up rapidly by the American oil companies. But the recognition of the methods by schools and institutions has been much greater in Europe than in America. The record of these methods in prospecting in the Gulf Coast area has been brilliant for the torsion-balance and seismic methods. The methods, furthermore, show

interesting potentialities for research in pure science problems of geology. The present geologic status of the methods is that the instruments and technique of observation have been developed much further than the general knowledge of the geologic interpretation of the results. Research on and with the methods is being done almost solely by commercial companies, by whom the results of the research mostly will not be released. These methods offer an interesting and almost untouched field of research to schools both of pure and applied science.-- Author's Abstract.

METHODEN DER ANGEWANDTEN GEOPHYSIK (METHODS OF APPLIED GEOPHYSICS)

By Richard Ambronn

Liesegangs Wissenschaftliche Forschungsberichte, Naturwissenschaftliche Reihe, Band 15, Theodor Steinkopf, Dresden and Leipzig, 1926, 258 p., 1,671 refs.

The purpose of the book is not to serve as a textbook for the execution of geophysical surveys, but to provide a complete and well-balanced, well-evaluated review of all the geophysical methods that may be used in economic geology so that the geologist, mining engineer, layman, or executive who has to do with them or is considering the use of them may come completely as possible to understand them, their possibilities, and their applicabilities, and to provide for the practical geophysicists and others interested in applied geophysics, the reference to all the more important literature of the subject.

The content of the book comprises an introduction giving a brief statement of the history of the development, and of the present status of the geophysical methods of exploration, and chapters on the gravimetric, magnetic, radioactivity, electric, seismic, and geothermal methods.

This book is now available in an English translation "Elements of Geophysics as Applied to Exploration for Minerals, Oil, and Gas." — Donald C. Barton.

8 - GEOLOGY

THE EFFECT OF GEOPHYSICAL METHODS ON DRILLING IN THE GULF COAST

By Donald C. Barton

The Oil Weekly, Houston, Tex., September 2, 1927.

The use of geophysics in connection with drilling in the Gulf Coast is another example of the replacement of haphazard methods of guess, luck, and repeated trial by moderately precise scientific methods, and marks another step in the evolution of oil production into an engineering science. The use of the geophysical methods in the Gulf Coast has shown that the torsion-balance and

the seismograph methods afford considerable, and in some places, high precision in the location of wells in refarence to the salt domes. Although as yet they have not proved practicable in the Gulf Coast, the electric methods of prospecting afford the bare possibility that ultimately they may afford considerable precision in the location of the wells in reference to the oil sands directly. The modern geophysical methods have nothingin common with the ancient but not honorable family of doodlebugs and wigglesticks which have never shown any sign of any ability to be of service to the oil operator. -- Author's Abstract.

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DEPARTMENT OF COMMERCE - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS [1]

No. 3

Compiled by Frederick W. Lee [2]

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1 The Bureau of Mines will welcome reprinting of this article, but requests that the following footnote acknowledgment be used: "Printed by permission of the Director, U. S. Bureau of Mines. (Not subject to copyright.)"

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1 - GRAVITATIONAL METHODS

PRACTICAL APPLICABILITY OF DIFFERENT TYPES OF TORSION BALANCES, ESPECIALLY OF HAFF'S TORSION BALANCE

By H. Winkelmann

Gerland's Beiträge zur Geophysik, Band 19,
Heft 2/3, Leipzig, 1928, pp. 321-333.

The author, who himself has worked in the field with various types of torsion balances, expresses in the article his experience with the recently marketed Haff-Torsion-Balance. The advantages of practical work with Haff's torsion balance as compared with other types are mentioned. In spite of low weight and corresponding small dimensions (Model M = 23.5 kg., Model Al = 11.5 kg.) the sensitiveness is not less than that in the largest instruments. It is at 1.10^{-9}, which is proved by calculations. A comparison with the corresponding values of other types of torsion balances (Eötvös, Askania, Gepege) is given. The mechanical features of the instrument are briefly described, and the balance is illustrated by a cross section of it. -- W. Ayvazoglou.

DETERMINATION OF THE ELEMENTS OF THE MAGNETIC AND GRAVITATIONAL FIELDS INDUCED BY AN INFINITELY LONG HOMOGENEOUS CYLINDER

By G. A. Gamburzeff

Gerlands Beiträge zur Geophysik, Band 19,
Heft 2/3, Leipzig, 1928, pp. 210-230.

The present work is a contribution to the question of the reason for the magnetic and gravitational anomalies in the government of Kursk (Russia).

For the purpose of determining from the data of a magnetic and gravimetric survey the distribution of the masses causing this magnetic and gravitational anomaly, it has been necessary to obtain formulas that would provide the simplest way of calculating the elements of the magnetic and gravitational fields of an infinitely long cylinder or prism. Such formulas adequate for graphical calculation are given in the first part of the article. In the second part (carried out together with Mr. M. Polikarpoff) the authors intend to solve the question whether the magnetic and gravitational anomalies can be explained by the deposits of iron-quartzites discovered by deep-boring work in the region of Stschigry.

Theoretical values for the elements of the magnetic and gravitational fields $\left(\frac{\partial W}{\partial Z}, \frac{\partial W}{\partial y}, \frac{\partial^2 W}{\partial y \partial z}, H \text{ and } Z\right)$ are calculated in a graphical way by means of the formulas established by Gamburzeff in the first part. The values obtained by calculations and observations agree one with another, and thus the anomalies can be explained as caused by the iron deposits, on condition that these deposits reach a depth of not over 7 kilometers.

The results of the calculations are given in tables and diagrams. -- W. Ayvazoglou.

THE ADVANTAGES OF CONTINUOUS RECORDING OF THE OSCILLATIONS OF THE BEAM OF A GRAVITATIONAL VARIOMETER (In Russian)

By S. Ghirin

Bulletin of the Institute of Practical Geophysics,
No. 2, Leningrad, 1926, pp. 196-200.

The author compares the two methods of registering the state of equilibrium the beam of a gravitational variometer:

1. By a continuous recording of the oscillations of the beam;
2. By a momentary (point) recording of the state of equilibrium after e full damping of the beam.

The main advantages of the first method, such as saving in the time cessary for observations (almost 50%) and a simpler construction of the instrunt (no additional devices for artificial damping of the beam), are mentioned pecially. Five diagrams showing the spirals of continuous recording of the cillations are given. -- W. Ayvazoglou.

NEUERUNG AN DREHWAGEN

(IMPROVEMENTS MADE ON TORSION BALANCE)

By W. P. Jenny

Zeitschrift fuer Practische Geologie, vol. 9, 1928,
pp. 141-143.

The impossibility of obtaining an accuracy of over ±5E for a mean value three measurements taken by a torsion balance at stations situated from 10 to meters one from another, in case these measurements are influenced by too rong local effects caused by heterogeneous subsoil or by an intersected terrain, sults in the necessity of finding a means for the increase of this accuracy. To this the author proposes to take several measurements at each station with fferent heights of the scale beam, and explains a special arrangement of the ot by which the beam automatically sinks for a distance fixed in advance after series of four, five, or six measurements is registered. This improvement must considered important, as it offers the sole possibility of an exact control of cal effects as well as of the work of several observers; besides, it constitutes e only means by which measurements in a very intersected terrain are possible.

By using a torsion balance provided with this new improvement, questions ncerning the organization of the work and the utilization of the personnel can solved more easily, thus these questions need not be neglected from the viewint of economy. -- W. Ayvazoglou.

A PRELIMINARY REPORT ON THE GRAVITATIONAL SURVEY OF THE JLETSKY SALT DOME IN THE SUMMER OF 1925 (In Russian)

By P. Nikiforov

Bulletin of the Institute of Practical Geophysics, No. 2, Leningrad, 1926, pp. 201-203.

A surveying expedition was organized to establish the boundaries of sal deposits near the city of Jletsk (Province of Orenburg), the richest in Russia.

According to estimates made by Prof. D. Mushketov, the deposits surpass forty hundred billion pounds. The salt is 99 per cent pure NaCl. The gravita- tional method was used for establishing the contours of the deposit; the result and data of investigation are to be published. -- W. Ayvazoglou.

2 - MAGNETIC METHODS

THE LABORATORY WORK OF THE MAGNETIC SECTION OF THE INSTITUTE OF PRACTICAL GEOPHYSICS OF THE U.S.S.R. (In Russian)

By J. Bahurin

Bulletin of the Institute of Practical Geophysics, No. 3, Leningrad, 1927, pp. 283-307.

The present paper contains information on the laboratory work of the magnetic section of the Institute of Practical Geophysics in examining the pre- cision of the Tieberg-Thalen instrument.

Twelve instruments were tested, and detailed data obtained with two of are given in tables from the calculation of which the systematic and accidental errors in determination of the components of the magnetic field amount to 10 p cent for higher values of H and ΔZ and to 30 per cent for small values of them As a considerable part of the errors are systematic, they may be reduced by acc calibration of the instrument by means of Helmholtz' rings.

In conformity with the results obtained, the author is of the opinion the instrument is sufficiently good for practical purposes, possessing the gre advantages of being easily portable, simple in operation, and of solid constru

In the second part of the article the author gives tables showing the magnetic properties of different rocks and ores determined by the magnetometri method. Pieces of rocks and ores in the form of cylinders of from 10 to 12 centimeters in length and about 1.5 centimeters in diameter were used for thes tests. -- W. Ayvazoglou.

3 - SEISMIC METHODS

THE EFFECTIVE MODULI OF ELASTICITY IN THE OUTER EARTH-SHELLS

By Reginald A. Daly, Harvard University, Cambridge, Mass.

Gerlands Beträge zur Geophysik, Band 19,
Heft 2/3, Leipzig, 1928, pp. 194-209.

The emergence-velocities of the longitudinal seismic wave (V) and transverse wave (v) for the Grundgebirge in Central Europe are 5.4 to 6.0 km./sec. and 3.2 or 3.3 to about 3.5 (?) km./sec., respectively; and V, just below the main discontinuity, which is generally described as 50 to 60 kilometers deep, is close to 7.9 km./sec. The emergence-velocities are higher than those expected in or quite near the surface of the Grundgebirge, if the effective elastic moduli were those which would be found by high-pressure tests on the average rock there existing - rock presumably not quite so incompressible as the average, fresh, flawless granite of the F. D. Adams and L. H. Adams experiments. This fact suggests some degree of failure of perfection in elasticity, the rock having higher effective moduli under the low-stress conditions of seismic waves than under the conditions of high pressure measurements in the laboratory.

Corroboration of this idea is found in an analysis of the hysteresis curves published by F. D. Adams and E. G. Coker.

The further suggestion is offered that the described high velocity of 7.9 km./sec. is similarly to be explained. Therewith increase of temperature is assumed partly to offset the probably tendency of increase of pressure to annul any imperfection of elasticity. However, below some such moderate depth as 120 kilometers and above the 2900-kilometer discontinuity, no failure of perfection in elasticity need be assumed.

The main question of this paper is the validity of the hypothesis that the material just below the "50 to 60 kilometer" discontinuity is basaltic (plateau-basalt). If perfectly elastic, holocrystalline plateau-basalt would give V the value of 7.2 to 7.3 km./sec. The difference from the "observed" value, 7.9 km./sec, is hypothetically explained by a rather slight departure of the basalt <u>in situ</u> from ideal elasticity. The assumption of a general earth-shell of peridotite near the surface of the globe does not agree with leading facts of geology and apparently is not compelled by the data of experimental physics.

A new explanation of the Conrad-Jeffreys-Mohorovicic discontinuity is also proposed for discussion. -- Author's abstract.

CONSIDERING THE THEORY AND CONSTRUCTION OF VERTICAL SEISMOGRAPHS (With 5 figs.)

By J. Wilip, Tartu-Dorpat

Gerlands Beiträge zur Geophysik,
Band 19, Heft 4, Leipzig, 1928

In connection with the vertical seismographs of Wiechert and Galitzin, t theory of an altered type of seismograph with a two-spiral-spring-suspension system is derived. By introducing a second spiral spring with the lower point c application above the pendulum arm, the limping movement of the seismograph is transformed into sinusoidal action. The conditions for obtaining longer periods are discussed. The two spiral springs may be orientated in a horizontal directi as well, which in certain cases may be more advantageous - for example, for the mechanical method of registration. Two characteristics of periods, that of a or spring system and of a two-spring system, are compared; in the latter case this curve is nearly a straight line; this means a constant inherent period in the wi reach of the declinations from the zero point. -- W. Ayvazoglou.

THE SEISMIC GEOPHYSICAL EXPLORATION METHOD

By Dr. R. Ambronn, Göttingen

The Mining Journal, vol. 164, Feb. 9, 1929, pp. 104-105.

The practical importance and the advantages of the seismic geophysical method of prospecting in connection with the development of the modern apparatus by which it is possible to determine with great exactness the depths of the ore bodies over wide areas (the error generally not exceeding 1 to 2 per cent), are mentioned in the present article. The results obtained with this method are con sidered by the author to be superior to the gravity measurements made by means o the torsion balance.

In consequence of the great improvements made in the instruments, the following advantages of the seismic geophysical method as compared with previous work are given especial emphasis:

1. Great reduction in the explosive charges to about 100th part of the charges necessary formerly, as it is to-day possible to obtain by the new appara amplifications up to several million times without interference from the natural seismic ground movements.

2. Great technical and economical importance due to the fact that vibra tion receivers are no longer used individually and independently one from anothe but a number of them, suitably placed at different points, can be connected by electric wire with a central registering apparatus so that the records are unite in a joint registration film (a figure shows such a film).

3. The registering apparatus mounted on an automobile remains unaffecte by the shocks, so that no precaution during the recording is necessary.

4. Small vibration receivers, mounted in the laboratory, can be used in the field without any special preparation. They transform when they receive the mechanical vibrations of the earth's surface and they automatically transform them into like-shaped electric current fluctuations, and the transformation relation is shown by the central registering apparatus for each individual receiver. A figure shows a film taken by means of such registering apparatus.

The uniting of the results obtained by explosions relating to a profile line is shown in a figure in the time curves. The geological profile derived from the registered system of time curves is shown through graphic construction and calculation.

The examples mentioned in the article demonstrate with what great accuracy it is possible to clear up even more complicated geologic structures by means of the seismic method of underground exploration. -- W. Ayvazoglou.

4 - ELECTRICAL METHODS

THEORETISCHE GRUNDLAGEN FUER DIE AUFFINDUNG VON STÖRUNGSKÖRPERN MITTELS SOLCHER GEOELECTRISCHER METHODEN, BEI DENEN ZWEI PUNKTFÖRMIGE ELECTRODEN ZUR ERZEUGUNG EINES KÜNSTLICHEN FELDES VERWANDT WERDEN

(THEORETICAL BASES FOR THE DETERMINATION OF THE INTERFERING BODIES BY MEANS OF GEOELECTRIC METHODS IN WHICH THE ARTIFICIAL FIELD IS PRODUCED BY TWO-POINT ELECTRODES)

By J. N. Hummel, Berlin

Gerlands Beiträge zur Geophysik, Band 20,
Heft, 3/4, Leipzig, 1928, pp. 281-287

If an artificial stationary field of current is produced in the inhomogeneous subsoil by means of spot or line electrodes, then in special cases the potential may be established. This is, for instance, possible if very good-conducting or nonconducting interfering bodies of an established shape are imbedded in the otherwise homogeneous isotropic medium and are disposed symetrically to the electrodes. The expedient which in such cases furnishes simple expressions for the potential is the method of sources and sinks ("Quellsenkmethode") which has been derived from the hydro and aero-dynamics. In a former essay we have uncovered the importance of the method of sources and sinks points for the theory of the geoelectric methods. In this instance the deposits are replaced by appropriately arranged points of swelling and sinking by the selection of which the shape of the interfering bodies, as well as the potential surfaces, is determined.

For the case that the field owes its coming into existence to two-spot electrodes, some such forms of bodies are stated and the equipotential lines at the surface of the earth calculated for an almost spherical deposit. The treatment of further cases not reckoned through here is hinted at. Amongst others a process worked out by N. Gella can obtain its scientific basis by very similar calculations -- Author's abstract.

GEOPHYSICAL PROSPECTING; ITS VALUE TO THE MINING GEOLOGIST

By John B. DeMille

Canadian Mining Journal, April 5, 1929, pp. 313-315.

Geophysical methods of prospecting have been widely accepted during the last five years as an essential aid in simplifying the problem of economically exploring rock areas.

Evidences of the increasing value of geophysical prospecting to the mining industry are summed up by the author as follows:

1. Half a dozen responsible companies for conducting geophysical surveys are organized in the United States and Canada.
2. Greatly improved apparatus is being developed through laboratory research and field experience.
3. The American Institute of Mining and Metallurgical Engineers has published a 700-page volume surveying the present important status of this new science and discussing some of its notable successes in commercial work.
4. American and Canadian mining companies are depending increasingly upon the results of geophysical surveys.
5. Geophysical surveying is recognized as assessment work by the Provincial Government in British Columbia, Manitoba, and Quebec, its recognition is under advisement in Ontario, and in the United States pressure is being brought to bear towards similar changes in the mining laws.
6. The United States Bureau of Mines has applied for an appropriation from Congress for approximately a quarter of a million dollars to finance geophysical research during the next five years.

In the opinion of the author, the preference for electrical methods of prospecting in comparison with the torsion balance, seismometer, and magnetometer methods for explorations in Canada is evident, the latter being more adapted for laboratory work rather than for field work.

A comparison of the five electrical methods (1 - self-potential, 2 - equipotential, 3 - megger, earth resistivity, 4 - low-frequency inductive, and 5 - high-frequency inductive) is given in a table; in a second table are outlined the principal factors controlling the successful operation of the electrical methods.

According to the experience of the author, the high-frequency inductive method has proved its superiority in the field, being not only 50 per cent more rapid but also sufficiently sensitive to detect good conductors at depths of 500 feet. The method is besides of primary importance in eliminating areas having no commercial possibilities for development. Other electrical methods, as well as magnetometer, may serve as effective supplements to the high-frequency method.

Successful use of geophysical prospecting depends, in general, on the competence of the operator in interpreting the reactions of this instruments, on the selection of the particular method suitable for working over the selected topographical and geological conditions, and on the cooperation of the prospecting crew while they are carrying on their observations. -- W. Ayvazoglou.

UNTERSUCHUNG DER POTENTIALVERTEILUNG UM VERSCHIEDENE STÖRUNGSKÖRPER, DIE SICH IN EINEM AN UND FUER SICH HOMOGENEN FELDE BEFINDEN

(RESEARCHES ON THE POTENTIAL DISTRIBUTION ABOUT DIFFERENTLY FORMED INTERFERENCE BODIES EMBEDDED IN A HOMOGENEOUS MEDIUM)

By J. N. Hummel

Gerlands Beiträge zur Geophysik, Band 21,
Heft 2/3, Leipzig, 1929, pp. 204-214

The potential distribution about differently formed interference bodies is ven; the interference bodies are embedded in an isotropic homogeneous medium, rough which passes a stationary current, which is in itself homogeneous. We are eling in particular with the theoretically and practically important case that od-conducting rod-shaped rotary bodies, which may be compared with straight going ys or veins, lie with their longitudinal axis in the direction of the current. e expedient, which gives expressions for the potential, consists in the method sources and sinks which is very often employed for similar problems.

The implacements are in this case replaced by suitably selected swelling stems, by the choice of which the shape of the interferring bodies and also the tential surfaces are established.

By testing with different swelling and sinking arrangements one can cceed in getting the desired shapes of the bodies. For such an imbedding of finite shape, which is at a certain depth under the surface of the earth, the tential on the upper surface may be exactly calculated, and the corresponding tential chart can be drawn. -- Author's abstract.

UEBER TURBULENTE EIGENSTRÖME DER OBERSTEN ERDSCHICHTEN UND IHRE BEZIEHUNGEN ZU DEN GESTEINSGRENZEN

(THE TURBULENT SELF-EXCITING CURRENTS IN THE EARTH'S UPPER LAYERS AND THEIR RELATIONS TO THE BOUNDARIES OF THE ORE DEPOSITS)

By H. Hunkel

Zeitschrift fuer Practische Geologie, vols. 7
and 9, 1928, pp. 103-109 and 143-149.

In addition to two kinds of spontaneous currents known in the earth's per crust, a third type one, called by the author the "turbulent self-exciting rrents" (Turbulenten Eigenströme) is discussed in the article; the peculiarities these currents are explained.

The existence of self-exciting currents, caused by spatial poles of small mensions, scattered irregularly and circulating in all directions, leads to a thod of determining the boundaries of ore bodies based on the theory of probilities. The method was tried out on an area to the east of Darmstadt, and the sults obtained from electric measurements were entirely confirmed in all cases boring and digging.

The use of the turbulent currents is explained from the physical viewpo as being caused by the difference in concentrations of chemical compositions of the solutions of the soil. Thirteen diagrams illustrating the results obtained the electrical method as well as by boring are given in the article.

Finally the author describes the instruments used by him and the techni procedure of his method; because of its unusual simplicity, rapidity, and suret the method promises to become a useful additional means of making up special charts. -- W. Ayvazoglou.

UNTERSUCHUNG DER POTENTIALVERTEILUNG FUER EINEN SPEZIELLEN FALL IM HINBLICK AUF GEOELECTRISCHE POTENTIALLINIENVERFAHREN

(EXAMINATION OF THE DISTRIBUTION OF THE POTENTIAL IN A SPECIAL CASE WITH REGARD TO THE GEOELECTRIC METHOD OF POTENTIAL LINES)

By J. N. Hummel

Zeitschrift fuer Geophysik, Jahrg. 4, Heft 2, 1928, pp. 67-76.

Having in view that in electrical methods of prospecting by means of electrodes the dependence of the distribution of the potential on the distribut of the electric conductivity in the subsoil and on the arrangement of the sourc of the currents is of great importance, and that the possibilities of the use o these methods, of their depth effect, and especially the interpretation of the sults of measurements must be studied carefully as well as a choice make of th most favorable form and arrangement of electrodes, the calculation and discussi of the potential distribution is considered by the author to be the basis for s researches.

With consideration of special cases, the author examines the distributi of the potential around an infinitely long hollow elliptic cylinder, the longitudinal axis of which lies perpendicularly in a homogeneous stationary fie of current. Practical conclusions connected with the geoelectric methods in wh electrodes are used are derived from the results. -- W. Ayvazoglou.

BEITRÄGE ZUR GEOELECTRISCHEN METHODE

(CONTRIBUTIONS TO GEOELECTRIC METHODS OF PROSPECTING)
(With 14 diagrams)

By J. N. Hummel

Zeitschrift fuer Geophysik, Jahrg. 4, Heft 4, 1928, pp. 178-203.

The article is divided into three main chapters. In the first chapter Hummel discusses the importance of the effect of several layers with different electric conductivity in the discovery of interfering bodies lying beneath them.

A potential function is established for the case in which the interfering bodies of different form and conductivity lie in a stratified medium through which a homogeneous stationary current is flowing. The author especially shows to what extent the disturbances of the normal potential surface picture, caused by the interstratification, are eliminated by overlying strata with better conductivity.

The second chapter deals with the influence of the unevenness of the terrai on the distribution of the potential in the subsoil. By calculation of several examples the author shows how this influence in a homogeneous isotropic subsoil can be determined in case a homogeneous stationary current is flowing through the ground.

Theoretical principles for the determination of elongated bodies of revolution and of further interstratifications are discussed in the third chapter. Here, the method of sources and sinks (Quellsenkmethode) adapted in hydrodynamics and aerodynamics, is used, and the importance of this method for the solution of geoelectric problems in general is indicated. -- W. Ayvazoglou.

UEBER DIE TIEFENWIRKUNG BEI GEOELECTRISCHEN POTENTIALLINIENMETHODEN

(THE EFFECT OF THE GEOELECTRIC METHOD OF POTENTIAL LINES WITH REGARD TO THE DEPTH OF AN ORE BODY)

By J. N. Hummel

Zeitschrift fuer Geophysik, Jahrg. 4, Heft 1, 1928, pp. 22-27.

The article deals with the electric method of prospecting, using two electrodes by means of which an electric current is sent into the conducting soil and the picture of current or potential lines formed at the surface of the ground is calculated. Conclusions on the structure of the subsoil may be derived from the variations of the picture obtained in reality by the comparison of it with the well-known regular picture obtained in case the subsoil is a homogeneous medium. Proceedings necessary for the establishment by this method of the depth at which an ore body is embedded (Tiefenwirkung) are examined. The author gives calculations on the thickness of the layer covering the deposit at which the indications on the surface of the earth can still be obtained. Two special cases are discussed. -- W. Ayvazoglou.

PHYSIKALISCHE GRUNDLAGEN EINER NEUEN GEOELECTRISCHEN AUFSCHLUSSMETHODE

(PHYSICAL PRINCIPLES OF A NEW GEOELECTRIC METHOD OF PROSPECTING)

By J. N. Hummel

Zeitschrift fuer Geophysik, Jahrg. 4, Heft 2, 1928, pp. 59-67.

Mathematical conclusions on the proceedings connected with the method elaborated by K. Sundberg are given by the author for a simple case. Values

obtained by calculations are compared with those obtained from experiments. The complications which as a rule will occur under the real conditions are mentioned.

The author examines the question of how the magnetic alternating field is influenced by the subsoil and what conclusions may be derived from the data obtained. A simple case, that of a layer with a considerably high conductivity covered by layers having a comparatively low conductivity, is discussed. Under this supposition the conditions for a theoretical establishment and the data obtained are considered by him to be of sufficiently close approximation to those existing in reality.

Eight diagrams supplement the mathematical conclusions. -- W. Ayvazoglou.

7 - UNCLASSIFIED METHODS

ARBEITS-GEBIETE DER ANGEWANDTEN GEOPHYSIK

(FIELDS OF OPERATIONS OF APPLIED GEOPHYSICS)

By Dr. F. Muller

Zeitschrift fuer practische Geologie,
vol. 5, 1928, pp. 67-71.

In addition to the fields of operations of geophysical methods of prospecting already explored in connection with prospecting of ore deposits, the author mentions the fields which so far have been investigated to a certain degree only. He describes the methods of investigations which can be applied for the discovery of water, giving to the mining geologist valuable and essential information. For example, in dry regions water horizons in the subsoil may be established by means of electromagnetic waves, owing to their property of being reflected by water. The presence of water may also be determined by seismic measurements, as the elastic properties of water are different from those of the upper dry layers. Examples where the possibility or impossibility of discovering water exists are discussed and illustrated by diagrams.

Another important field of operations of applied geophysics is that of studying the conditions and structure of the earth's surface in connection with the erection of buildings. Here the question is of collecting data on the thickness, homogenousness, etc., of the layers supporting the uppermost strata in order to determine not only the possible static load but also the behavior of the subsoil and its capability of resistance to the dynamic load occurring from elastic oscillations and from other mechanical reasons.

The determination and measurement of the capability of the resistance of the buildings to shocks as depending on the specific property of materials may be accomplished by applying the Sieberg-Cancanic scale, used in seismics, which deals with relations of the dangerous influences of the shocks as well as accelerations transmitted to the particles of the soil; these relations are established by the

ormula $\beta = \frac{4a}{\tau^2}$ (a - amplitude of the soil; τ - time of the oscillation of the ubsoil; and β - acceleration of the particles at the soil.) The geophysical rospecting of the subsoil becomes especially important in case of barring river alleys and making other hydraulic works.

The determination of the structure of the subsoil may as a rule be ccomplished by using the radioactive measurements.

Thus in addition to geological researches, applied geophysics may serve lso for the solution of many other problems. Geophysicists should pay attention o the fields of application of geophysical methods mentioned above. -- W. yvazoglou.

FLACHLANDSGEOLOGIE UND GEOPHYSIKALISCHE UNTERGRUNDFORSCHUNG

(STUDY OF THE GEOLOGY OF PLAINS AND THE SUBSOIL PROSPECTING BY MEANS OF GEOPHYSICAL METHODS)

By H. Reich, Berlin

Zeitschrift fuer practische Geologie,
Heft 8, August, 1928, pp. 128-131

The influence of petrographic peculiarities of diluvial and alluvial eposits upon the gravitational, seismic, magnetic, and electric methods of pros- ecting are discussed.

All the methods mentioned may be used with success except the torsion- alance method, for which the irregular formations of the terminal moraine make ometimes a correct calculation almost illusory, as, owing to the irregular distri- ution of the density of glacial sediments, errors up to 21 Eötvös are very probable nd even greater errors are possible. The physical structure of diluvial rocks akes geophysical prospecting possible; their great porousness facilitates a eneral moistening of them, thus their electrical conductivity is increased ccordingly. The mechanical destruction of magnetic rocks mixed with the sediments revents their strong magnetic effect. The stratification of diluvial rocks, which n general is not very solid, requires only a slow velocity of propagation of lastic waves; their small density makes the discovery of the presence of more olid rocks in the diluvial subsoil possible.

The physical effects of the diluvial glacier deposits were studied on the arge areas of the North German plain, which is especially favorable for eophysical researches. Some data on the velocity of longitudinal waves, as well s on the specific electric resistances in connection with the percentage of water or different rocks at different places, are given. -- W. Ayvazoglou.

PROSPECTING AND STUDY OF ORES BY THE GEOLOGICAL COMMITTEE IN THE U.S.S.R. (In Russian)

By V. K. Kotulsky

Bulletin du Comité Géologique,
vol. 27, No. 2, Leningrad, 1928.

The attainments of the Geological Committee of the U.S.S.R. in geophysical methods of prospecting during the five years from 1923 to 1928 are briefly described.

Figures showing the high yearly development of the work may best illustrate this progress.

Areas Investigated (In Square Kilometers):

	1923	1924	1925	1926	1927
By magnetic methods	16	110	215	260	526
By electric methods	--	3	38	52	80
By gravimetrical methods	--	--	4	250	325
By radioactive methods	--	--	--	20	50

Progress in Magnetic Methods.- Theoretical studies to determine the magnetic field for bodies having the form of ellipsoids of revolution are to be mentioned especially. A new apparatus is constructed which gives more accurate data on weak magnetic ores than those obtained by Tiberg-Thalen instruments; the new apparatus besides has a smaller weight, is more easily portable, and is more sensitive. Improvements on the Tiberg-Thalen apparatus were made. More than 1,200 square kilometers were investigated by this method. Detailed investigation of about 230 square kilometers were made in the regions of Krivoy Rog, Mount Blagodat, Magnetic Mountain in the Urals, and at other places.

Electric Methods.- The method of equipotential lines and that of determining the intensity or induction were studied carefully. As all the phenomena in connection with the method of equipotential lines could not be explained by mathematical analysis, special experimental researches for the determination of the form of the normal field, as well as for clearing up of anomalies caused in the field by the conducting lines were accomplished in the following way: A body representing the deposit was put into a tank filled with water and the electrodes were put over the surface of the water. Observations were made by using the telephone, and the drawing of equipotential lines was performed by a pantograph adapted in a clever manner for this purpose.

In this way the phenomena caused by conductors of different forms and placed differently with regard to the electrodes and the surface of the water were studied. Some principles which ought to be taken into consideration for the deciphering of the results, as well as for the contouring of an ore body according to the lines of gradients, could be established.

Notwithstanding this, there are still phenomena, especially if investigations in dry countries are made, by which the method of equipotential lines can not be considered to be satisfactory; the Geological Committee expressed the desire that these phenomena be studied especially.

Essentially the study of the method of intensity or induction consisted of investigating the electromagnetic field created under the influence of an alternating current sent into the earth or directed along a closed loop.

The elements of the field are determined by means of a frame and the intensity is measured either by the aid of an audion voltmeter or by the method of two frames.

Theoretical calculations of the normal field are considered by the author to have been made by the geophysicists working for the Geological Committee of the U.S.S.R. independently from those studying this question abroad. These calculations were verified in practice. In addition to these two methods, already tried out in prospecting, preliminary experiments with short waves, as well as an improvement on Chilson's method, were made. After a series of preliminary experiments a special transmitter was constructed, and the first trials on the terrain were to be performed.

An "experimental field" for preliminary elaboration of new methods of electric researches and for the testing of instruments was arranged.

Good results were obtained by using the method of equipotential lines for discovering ore bodies lying under alluvial deposits. The discoveries were verified by digging and boring.

Gravitational Method: The results obtained by using the gravitational method of prospecting were very favorable; this method is considered important for detailed investigation, especially on a covered terrain.

A series of improvements in the existing variometers was made.

Radioactive Method: The radioactive method was developed in two directions: On the one hand a method for determining the radioactivity of ore-samples available from the collections of the Geological Committee was studied, and on the other hand researches on radioactive elements in the fields were made. For the determination of the radioactivity of the ore-samples a special apparatus, provided with a cover inside of which a box with samples is placed, was constructed; the amount of ions in the air sucked through it is measured by Ebert's electrometer. Only from 5 to 10 minutes are required for this determination. More than one million ore samples are at the disposal of the Geological Committee. About 15 per cent of all samples have already been examined, and a series of indications of ore deposits, most of them in Turkestan, has been obtained. A similar device was tried for field work and proved to be satisfactory. -- W. Ayvazoglou.

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DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS [1]

No. 4

Compiled by Frederick W. Lee [2]

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1 - GRAVITATIONAL METHODS

DIE GENAUIGKEIT DER MIT DER EÖTVÖS-SCHEN DREHWAGE DURCHGEFUHRTEN RELATIVEN SCHWERKRAFTMESSUNGEN

(The Accuracy of Relative Gravity Measurements with Eötvös Torsion Balance

By Karl Oltay

Geodätische Arbeiten der Baron R. V. Eötvös-schen Geophysischen Forschungen III, Budapest, 1928.

A series of 15 stations beginning with Potsdam and Budapest and ending with Budapest and Potsdam were occupied in the period August, 1908, to January 1909. The intermediate stations were all at points which had been connected by Baron Eötvös with torsion-balance traverses. The observations were made with an invariable pendulum of the standard four-pendulum type of instrument of the Geodetic Institute, made by Stückrath at Berlin-Friedenau. The observations at each of the field stations lasted one to three days with one exception; two or three time determinations were made; four to eight series of pendulum observations were made; the error of determination of the elevation of the instrument above mean sea level ranged from 0.30 meter to 1.10 meters, with the exception of the Arad and Baja stations, where the elevation was known more accurately and averaged about $\pm$ 0.8 m, which would cause an error of $\pm$ 0.25 x 10^{-3} dynes. No topographic correction was applied. The values for $\triangle g$ were taken from Eötvös Report on Geodetic Observations in Hungary, especially Observations with the Torsion Balance, Budapest, 1910. The differences in $\triangle g$ as determined by the torsion balance and by the unvariable pendulum were: Kuvin-Hidegkut 12 km.0.000 Livada-Kuvin 9 km.0.001, Pankota-Livada 13 km.0.004, Kuvin-Arad 2[illegible] km 0.000, Pankota-Arad via Kuvin 42 km.0.005, Pankota-Arad via Kurtics 50 km.0.000 dynes.

Oltay concludes that if the stations are close enough together and if the terrane is rather flat, the measurement of $\triangle g$ with the Eötvös torsion balance is as accurate as with the invariable pendulum. -- Donald C. Barton.

GRAPHICAL METHODS OF CALCULATION IN INTERPRETATION IN WORK WITH THE TORSION BALANCE; A DISCUSSION OF C. A. HEILAND'S A NEW GRAPHICAL METHOD FOR TORSION BALANCE TOPOGRAPHIC CORRECTIONS AND INTERPRETATIONS.

By Donald C. Barton

Bull. Am. Assoc. Petrol. Geol., vol. 13, No. 4, Apr., 1929, pp. 388-391.

A table is given showing the percentage error in the calculated gradient or differential curvature produced by an error of 10 or 20 per cent in the assumption of prisms at right angles to the cross section. That error in the case of a 10 per cent error in the assumption of the length in general, and in case of a 20 per cent error in many cases, is less than the probable error of field observations. The assumptions in regard to length at right

angles to the section need to be only approximate, and the line of section need be only approximately an axis of symmetry. Graphs of that type are applicable to a wide range of geologic structures and where applicable are faster and easier to use than graphs based on cylindrical or spherical coordinates. -- Donald C. Bartin.

C. A. Heiland in reply to D. C. Barton's discussion of his paper: Bull. Am. Assoc. Petrol. Geol., vol. 13, No. 4, Apr. 1929, pp. 391-393.

The writer stresses the universal applicability of his method for the calculation of terrane corrections or of gradient and differential curvature on asymmetric structures or at any point on a symmetric structure and states that the time required to use his method is not as great as Barton concludes, but agrees with Barton that the latter's method is easier for stations on axes of symmetry. -- Donald C. Barton.

GRAPHICAL TERRANE CORRECTION FOR GRAVITY GRADIENT

By Donald C. Barton

Tech. Paper 444, Bureau of Mines, 1929, 12 pp., 6 figs.

The terrane around the instrument is divided into octants and into zones bounded by circles of 5, 10, 20, 40 ..... 640 by 2^n radius. On each zone a pile of blocks is visualized as built up with the vertical thickness of each block so calculated that the block will produce a gradient of 0.1E at the origin. A graphic chart is constructed to represent the cross section of these blocks along the axis of an octant. To permit a convenient-sized chart to represent considerable horizontal and vertical distance, the position of the 5 by 2^n lines of distance and of 0.5 by 2^n lines of elevation are plotted logarithmically, although the intermediate spacing is linear. The elevation of the topography is determined at distances of 5, 10, 20 ..... 5 by 2^n for each octant; the points are plotted on the graphic chart, and the gradient effect of the topography is then read from the chart by adding up the number of squares. As the origin is taken at the center of gravity of the instrument, the graphic chart within a certain range is independent of the height of the center of gravity of the instrument above the ground. -- Author's abstract.

RELATIVE SCHWEREKRAFT-MESSUNGEN NACH DER REFERENZMETHODE MIT DRAHTLOSEV FERNSTEUERUNG DER KOINZIDENZE-APPARATE. (MEASUREMENTS OF RELATIVE GRAVITY BY THE REFERENCE METHOD WITH USE OF WIRELESS CONTROL OF THE COINCIDENCE APPARATUS.)

By Ernst Berger and Karl Mader

Gerland's Beitrage zur Geophysic, Band 21, Heft 4, 1929, pps. 355-365.

An apparatus is described which makes use of wireless control of the coincidence apparatus as well as of the recording chronographs. The wireless control is given by the second swings of one astronomical clock common to

all stations and therefore makes possible a synchronous drive of the coincidence apparatus at all the stations, whereby very exact measurements of relative gravity can be made at outlying stations.

The results of the first observations with the apparatus, for the determination of relative gravity between Laxenburg and Vienna, are given. -- Donald C. Barton.

THE GRAVITY GRADIOMETER

By H. Shaw and E. Lancaster Jones

The Mining Magazine, vol. 40, No. 5, May, 1929, pps. 272-279.

The gradiometer is a radical innovation in the Eötvös balance. A three-armed beam carries two lower weights (instead of the conventional one) and a rigid rod supporting the upper weight. The differential curvature is not measured, and observation of the instrument in three azimuths at 120° apart is sufficient mathematically to give the gradient. The beam comes to rest in 20 to 25 minutes. The overall width of the instrument is 7 inches and the overall height 4 feet. The weight of the instrument (including tripod) is 100 pounds. The shelter for the instrument weighs 90 pounds. The instrument is read visually. Its accuracy according to the authors is 1.5 to 2E. In a 24-hour test stations were occupied. -- Donald C. Barton.

ÜBER MESSUNGEN MIT DER GLEICHMÄSSIG GEDREHTEN DREHWAGE UND EIN NEUES RECHENVERFAHREN

(MEASUREMENTS WITH A TORSION BALANCE ROTATED UNIFORMLY AND A NEW METHOD OF CALCULATION)

By Karl Kilchling

Ztschr. für Geophysik, Jahrg. 6, 1927, pp. 281-285.

A statement is given on the experiments of measurements accomplished by a torsion balance rotated uniformly, as well as on very simple and quick method of calculations for the evaluation of the curve obtained.

As an arrangement of the Eötvös torsion balance for a uniform rotation was difficult, the box of the balance, instead of resting on a foot, was suspended at a steel wire, and the rotation was obtained by means of clockwork provided with a stopping device. The total time of rotation was three hours. Owing to the high moment of inertia of the box of the balance, the rotation proceeded with a satisfactory uniformity, although the disturbances caused by the clock-work could not be avoided entirely.

The measurement at one station only was made but was repeated many times.

The gravity curve obtained is shown in two figures.

The calculations concerning the curve are carried through, and the working out of the data is described.

The time required for the measurement was about two hours. The whole calculation of the gradient and of the directing forces, using the method described, according to the author, takes only ten minutes. -- W. Ayvazoglou.

ZUR FRAGE NACH DER URSACHE VON LOKALEN GRAVIMETRISCHEN UND ERDMAGNETISCHEN STORUNGEN UND IHRE WECHSELSEITIGEN BEZIEHUNGEN

(CONCERNING THE QUESTION OF THE REASONS FOR THE LOCAL GRAVIMETRIC AND EARTH-MAGNETIC DISTURBANCES AND THEIR MUTUAL RELATION.)

By H. Haalck

Ztschr. für Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 209-219 and 263-272.

The article is divided by the author into two chapters:

Chapter I, "Diagrams as a means of aid in the interpretation of the pictures obtained by torsion-balance measurements."--

Diagrams are given by the aid of which the influence of the difference in density of the underground bodies upon the second differential quotients of the potential of the force of gravity can be established.

Practical use of the diagrams is shown in an example and the application of them for interpretation of pictures obtained by torsion-balance measurements is explained. The theoretical relations to the corresponding diagrams of the local earth-magnetic anomalies, as well as explanation of some practical examples, are given in the second chapter:

Chapter II, "Theoretical relations between the torsion balance measurements and earth-magnetic measurements; diagrams as a means of aid in the interpretation of the local earth-magnetic disturbances."--

Here the author examines briefly the theoretical relations between the disturbances of the force of gravity and the local earth-magnetic disturbances and shows how the diagrams which serve for the establishment of the influence of mass inequalities of any form upon the torsion balance can be used on the influence of these masses upon the earth-magnetic force components. Practical application of the diagrams is given in an example. -- W. Ayvazoglou.

EIN GRAPHISCHES VERFAHREN FÜR DREHWAGENMESSUNGEN ZUR BERECHNUNG DER GELÄNDEWIRKUNG UND DER WIRKUNG BELIEBIG GESTALTETER MASSENKÖRPER

(GRAPHICAL PROCEEDING OF TORSION-BALANCE MEASUREMENTS FOR THE CALCULATION OF THE TERRAIN INFLUENCE AND OF THE INFLUENCE OF LARGE BODIES OF ANY FORM)

By H. Haalck

Ztschr. für Geophysik, Jahrg. 4, 1928, pp. 161-178.

In order to be useful in practice the graphic proceeding of torsion-balance measurements for the establishment of terrain corrections must, according to the author, answer, as far as possible to the following requirements:

1. Be of a sufficient accuracy, either on a level or intersected terrain;
2. Shall not be restricted to any certain levelling operation;
3. Shall not depend on a certain height of the position of the torsion balance above the surface of the earth;
4. Must be simple in manipulation in using diagrams and formulas.

In the article a simple process is described which might be convenient for torsion balance measurements on any terrain and at any height of the instrument above the surface of the earth. Its practical application is explained by an example. The method is suitable also for a simple calculation of the influence of large bodies of any shape on the torsion balance.

The article is provided with tables and diagrams. -- W. Ayvazoglou.

2 - MAGNETIC METHODS

MAGNETISCHE MESSUNGEN IM ÖSTLICHEN RIESENGEBRIGE

(MAGNETIC MEASUREMENTS IN THE EASTERN RIESENGEBIRGE

By Gerhard Meyer

Abhandlungen der preussischen geologischen Landesanstalt, Heft 105, Berlin, 1927, 53 pp.

Contents of the pamphlet:

1. Bibliography;
2. Introduction;

3. Instrumental and physical part;

4. Analysis of the results of measurements;

5. Geological interpretation of the results of measurements;

6. Remarks to Map I (scale 1:100000)

7. Remarks to Map II (scale 1:25000)

8. Table I. Examination of crystalline slate of the eastern Riesengebirge concerning its magnetic peculiarities;

9. Table II. List of surveyed stations;

10. Table III. List of stations at which additional magnets were used for measurements;

11. Table IV. Repeated measurements;

12. Table V. List of surveyed stations arranged numerically.

The results of the measurements accomplished by the author in Septem-
er, 1926, in the Riesengebirge with the purpose of studying the magnetic
havior of granite blocks with regard to the zone adjoining them are exam-
ed. Three hundred and eighty-two measurements were made at 264 stations.
e distance between the stations was about 2 km. in the region of the granite
posit. In the zones adjoining the granite this distance was reduced to
out 150 meters.

Preparatory work as well as the evaluation of the results was accom-
ished under the direction of Dr. H. Reich.

Schmidt's local variometer, manufactured by Askania Werke, was used
r the measurements of the vertical intensity.

Tables and maps have been compiled with great accuracy. Based on the
ta collected by the magnetic measurements in the Eastern Riesengebirge the
thor concludes that the very important indications on the structure of the
bsoil obtained by magnetic measurement have proved again to be very useful
drawing geological maps. The magnetic research of the vertical intensity
th the variometer can be accomplished easily so that already during the
rk in the field the difference in the magnetization of various rocks may be
tablished. Thus the great anomalies of the quartz-amphibolites to the south
Adlersruh, the lenses of feldspath-amphibolites at stations 237 and 164,
well as the Schmiedeberg ore area could be established by the measurements
ready during the field work.

The representation of the Z-isonomalies made it possible to mark the
undary lines of the granite area formed with the crystalline slate of the
phibolite group adjoining this area on the east.

Accurate data on the geological conditions of the green-slate areas to the north of the main deposit could not be obtained owing to the too great distances between the stations, but a considerable difference of the weakly magnetized green-slate and strongly magnetized amphibolite slates was established nevertheless. -- W. Ayvazoglou.

ZUR FRAGE DER REGIONALEN MAGNETISCHEN ANOMALIEN DEUTSCHLANDS, INSBESONDERE DERJENIGEN NORDDEUTSCHLANDS

(REGIONAL MAGNETIC ANOMALIES IN GERMANY, ESPECIALLY THOSE IN NORTH GERMANY)

By H. Reich

Ztschr. für Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 84-100.

About 2,000 measurements of magnetic vertical intensity, at 1,360 stations, were made by the author in the different parts of northern Germany during the last five years; Schmidt's magnetic field balance was used. The main regional magnetic anomalies were established. The probable geological reasons are discussed and conclusions are drawn based on comparison with other similar anomalies, the causes of which are known.

Great disturbances (especially positive anomalies) were found to be in areas with eruptive rocks and crystalline slates. The positive anomalies of the parts of north Germany covered with diluvium can probably be explained also by the influence of the eruptive rocks deposited at greater depths. Areas with great sedimentary masses were indicated by negative anomalies.

Maps showing the values of horizontal anomalies in several areas in Germany, some of them prepared by the author himself, are added to the article.

Although a brief description of the magnetic anomalies in North-Germany has already been published by Reich in the "Zeitschrift der deutschen geologischen Gesellschaft" (Jahrg 79, 1927, pp. 335-339), the author promises to publish more details after the material already obtained is ordered, and some additional field work accomplished. The work will appear in the "Abhandlungen der preussischen geologischen Landesanstalt". -- W. Ayvazoglou.

BEMERKUNGEN ZUR DEN MAGNETISCHEN VERMESSUNGEN DES GEBIETES ZWISCHEN ZALZGITTERER HÖAEBZUG UND OBERWALDSATTEL DURCH E. KOHL UND R. KRAHMANN

(REMARKS ON THE MAGNETIC MEASUREMENTS MADE BY E. KOHL AND R. KRAHMANN ON THE TERRITORY BETWEEN THE ZALZGITTERER MOUNTAIN CHAIN AND THE OBERWALD SADDLE)

By H. Hunkel

Metall und Erz, Jahrg. 25, Heft 22, 1928, pp. 571-582.

The following articles of E. Kohl and R. Krahmann are discussed in the present paper:

1. Beträge zur erdmagnetischen Erforschung Norddeutschlands (Contributions to the earth-magnetic researches made in Northern Germany), by E. Kohl, Jahrbuch der preussischen geologischen Landesanstalt, 1928, pp. 124-137.

2. Über geoelektrische und magnetische Untersuchungen (on geoelectric and magnetic researches), by R. Krahmann, Metall und Erz, Jahrg. 23, 1926, pp. 583-586.

Summarizing the above articles of Kohl and Krahmann, with the help of two diagrams given in those articles, one showing the "magnetic and geological profile between the Zalzgitterer mountain chain and the Oberwald saddle", represented by E. Kohl, and the other the "Magnetic experimental measurements made over the salt domes and iron ore in Zalzgitter and Flachstockheim," by R. Krahmann, Hunkel states that the interpretation of the magnetic measurements in the Zalaitterer mountain chain published by Kohl must be considered to be inconclusive and that the measurements accomplished by Krahmann in the same region, proved to be entirely useless. Hunkel writes:

"E. Kohl examines his profile measurements taken between the Zalzgitterer mountain chain and the Oderwald saddle, as usual, by comparing them with the geological profile and assigns to the rocks various 'positive' and 'negative' effects of disturbances with regard to the mean magnetic value of the terrain in question. The purpose of the present article is to show that Kohl's interpretation is neither sufficient nor free from contradictions, and that neither the Trias, Jurassic, and chalk layers, nor the Zechstein salt have evidently influenced the magnetic field on the surface of the earth, but that only the existence and the position of the brown hematite vein between the Jurassic and chalk layers are responsible for the course of the magnetic curve given by Kohl. Therefore an interpretation of the magnetic measurements, which is in itself, as well as with regard to the geological profile, entirely correct and complete without any tectonic hypothesis, is possible.

"The parallel profiles measured by R. Krahmann independent of Kohl contain so many measurement errors that an interpretation of them is useless. Therefore the interpretation given by Krahmann may be considered to be an arbitrary explanation based on the known geological profiles, which, as shown by the comparison with the above-mentioned interpretation of Kohl's profile, are besides not correct."

Hunkel's article naturally worked replies from both Kohl and Krahmann. A detailed answer on all the points of the dispute, illustrated by diagrams, is given by Krahmann.

The answers as well as the final conclusion made by Hunkel are published in the same paper. -- W. Ayvazoglou.

3 - SEISMIC METHODS

A SEISMIC METHOD OF DETERMINING THE DEVIATION OF DULL HOLES

By Mark C. Malamphy

The Oil Weekly, vol. 53, No. 6, April 26, 1929, pp. 31-32, 70-80.

The position of the bottom of a well may be determined by dropping the detector of an electric-type seismograph to the bottom of the well and exploding small charges of dynamite at a certain pattern of locations. Formulas for the computation of the position of the bottom of the hole from the results are given. The charges of dynamite required are small, and the time necessary to make the survey is less than a day. The cost of the determination is low. The greatest difficulty will be in applying the method in an area where the beds dip steeply.

The use of several detectors suspended at different depths will allow simultaneous determination of position of well hole at as many points. No mention is made of the actual application of this method by the Geophysical Research Corporation. -- D. C. Barton.

FACTORS IN DESIGN OF PORTABLE FIELD SEISMOGRAPHS

By Mark C.Malamphy

The Oil Weekly, vol. 53, No. 1, Mar. 22, 1929, pp. 28-30, 84-94.

Field seismographs are of two types, "mechanical" seismographs in which there is mechanical magnification of the movement of the heavy mass, and "electric" seismographs in which the movement of the heavy mass is transformed into an electrical impulse which is then amplified. The following factors in the design of the seismograph equipment are discussed: Weight of equipment including carrying cases, over-all dimensions, transportation equipment, sensitivity (amplication) of seismograph, frequency (selectivity) characteristics, damping of recording apparatus, timing system, simplicity of adjustments and operation, sensitivity of seismograph or blastophone to sound and receive air waves, accessibility of all instruments for adjustment repair or replacement of parts, provision for development of records in the field, method of transmitting the exact instant of the shot, radio equipment, and power supply for electrical equipment.

This is an interesting and reliable account of many details of the art of seismic prospecting. -- Donald C. Barton.

SEISMIC METHODS IN GEOPHYSICS

By A. O. Rankine

The Mining Magazine, vol. 40, No. 5, May, 1929, pp. 311-314.

Abstracts from a paper by the author are appended to give a condensed ather mathematical explanation of the seismic method of prospecting. -- . C. Barton.

4 - ELECTRICAL METHODS

"GEOPHYSIKALISCHE SCHURFUNGEN AUF ERDÖL"

(GEOPHYSICAL PROSPECTING FOR OIL)

By Norbert Gella

Ztschr. fur praktische Geologie, April, 1928, pp. 49-54.

The author points out the importance of geophysical methods of oil rospecting by which much time and money are saved.

After a brief historical review of oil prospecting on the Gulf coast n Texas and Louisiana by means of borings, which in most instances were of ncertain character although the expenses were enormous, Gella mentions the iscoveries of oil by modern geophysical methods (seismic and torsion-balance easurements).

Based on the good results obtained already in finding ore deposits y electric methods of prospecting Gella recommends this method also for oil rospecting.

The property of oil of being a bad conductor makes determination of ts position possible by drawing current line pictures.

Gella recommends carrying out a testing program by establishing send- ng stations, investigating the terrain, and obtaining, at a number of points, ata on the horizontal and vertical components of the magnetic field, graph- cal representation of the data, and comparison of the picture with that ob- ained for a normal field (on a homogeneous ground).

The author cites examples of oil prospecting in Texas by electric ethods, by which areas not containing oil could be determined, thus saving he money necessary for test holes and of determination of the direction of il sands from NE. to SW, and not from W. to E, as has been expected before.

The exact establishment of salt dome borders in two tests in Texas nd Louisiana at a depth of 600 to 800 feet has proved the importance of the lectric method of oil prospecting.

Experiments made in Germany must also be considered to be very satisfactory as, although no oil was found, the absence of it was established with surety; thus the uselessness of drilling was proved and saving of large sums of money reached. -- W. Ayvazoglou.

DIE BESTANDTEILE DES MAGNETISCHEN FELDES BEI GEOPHYSIKALISCHEN BODENUNTERSUCHUNGEN MIT WECHSELSTROM UND SEINE BEEINFLUSSUNG DURCH LEITENDE EINLAGERUNGEN

(THE ELEMENTS OF THE MAGNETIC FIELD IN GEOPHYSICAL RESEARCHES PERFORMED BY MEANS OF THE ALTERNATING CURRENT AND THE INFLUENCE UPON IT OF DEPOSITS OF GOOD CONDUCTIVITY)

By W. Heine

Ztschr. für Geophysik, Jahrg. vol. 6, 1927, pp. 293-307
(with 17 diagrams).

The magnetic field produced by alternating current flowing into a homogeneous ground as well as into deposits of different conductivity is calculated under simplified assumptions, the admissibility of which is discussed.

Curves of the change of the angles of inclination of the magnetic vectors at the crossing of an ore vein are drawn for a series of examples, according to the formulas obtained; two measurements taken on the terrain are compared.

The magnetic vector at any point of the area under investigation can be supposed to be composed of the following three elements: (1) The magnetic field of the line; (2) the magnetic field of the current flowing into a stratum of good conductivity, and (3) the field of the current which flows in an undisturbed and electrically homogeneous ground without being influenced by the deposits.

Heine calculates these three elements under simplified assumptions and gives diagrams of curves showing the angles of inclination of the magnetic vectors, neglecting the phase relation, as well as the influence of the current induced in the ground by the line.

The induced electric eddy-current field produced by an alternating current flowing through the wires leading to the electrodes in the ground is examined in the last part of the article. -- W. Ayvazoglou.

"ÜBER DEN ANGEBLICHEN GEOPHYSIKALISCHEN NACHWEIS VAN ZALZDOMEN IM OBERELSASS

(ON THE REPORTED DISCOVERY OF SALT DOMES IN UPPER ALSACE BY GEOPHYSICAL PROSPECTING)

By H. Hunkel

Ztschr. f. d. Kali-und Steinsalzindustrie sowie das Salinenwesen, Nos. 23, 24, 1928, and No. 1, 1929, pp. 366-368; 383-385; 7-10.

The purpose of the two examples published in the articles is to show hat the geophysical prospecting method, accomplished by the "Société de rospection Electrique (Schlumberger Method) à Paris", which is called Electric boring" and consists of the deduction of the specific resistance f the underground bodies situated at any depth, from the potential measure- ents made on the surface of the earth, against which, of course, certain heoretical doubts exist, did not prove to be in satisfactory conformity with he expected resistance constants obtained from the actual results of boring.

This method was further used in the Rhintalgraben near Ensisheim; nd a picture of curves of equal resistancy for a certain depth, not fixed xactly, was drawn, based on the potential measurements on the surface of the arth from which the existence and position of a salt dome in the Rhintalgraben as deduced, which as a matter of fact is a geological novum. The article hows that the analogy between the curves of equal resistances and the topogra- hy of the salt mountains in Rhintalgraben, as established and used by Schlum- erger, is entirely inconclusive and that neither a salt dome nor even the xistence of salt in any form can be deduced from Schlumberger's resistance urves. Therefore Schlumberger's electric measurements can not be considered n any way as an avidence of the existence of salt domes in Upper Alsace. ut with the aid of another definition of Schlumberger's curves, it is possible o put the electric measurements into perfect harmony concerning all the de- ails in connection with the tectonic of broken soil of this area and to stablish the fact that the cracks, especially of highly elevated soil, are he main reasons of the Schlumberger's curve picture.

With the aid of intensive electric measurements according to a suit- ble procedure, as well as by the aid of a new theory concerning them, men- ioned above, further understanding of the tectonic of broken soils on the pper Rhine and the search for salt domes, especially those of small depth, romises good success.

The following supplement concerning the same question is given by the uthor:

When the above mentioned articles were printed another publication of . and M. Schlumberger on the discovery of a second "salt dome" 2 kilometers ast of Hettenschlag in Upper Alsace in a strict prolongation of the Meien- eimer dome was received.

The representation of the electric measurements is, of course, not added to the brief description. Here Schlumberger insists again that the curves of equal resistances derived from the measurements answer the approximate circumference of the salt dome, which became perceptible owing to a "considerable local reducing of the resistance". As the specific resistance of alluviums is between 300 and 400 ohms per cubic meter, and that of marl between 10 and 20 ohms, Schlumberger deduces that the resistance minimum is due to the fact that over the "salt dome" there are probably layers of marl of good conductivity which mount up over the salt at about 10 meters below the surface of the earth, as proved by drilling by which the salt was reached at a depth of 100 meters. (It seems that here one of the borings mentioned in the previous articles is concerned). As I have proved above, the values of the electric resistance along the boring cannot be brought into connection with the values of the resistances expected according to the boring profile.

A series of remarks by Schlumberger in his latest statement makes me believe that the method of the definition of resistances at any depth by means of potential measurements at the surface of the earth can not be based on an exact foundation. The new "salt dome" is evidently a high elevated dome between two transverse cracks of the prolonged Meienheimer dome, and the electric indication may be explained in the same way as above by the influence of the prolongation of the large crack by which the Meienheimer dome is limited on the west. -- Author's abstract.

ZUR STREITFRAGE DER DIREKTEN AUFFINDUNG VON ERDÖLLAGERSTÄTTEN MIT HILFE ELEKTRISCHER VERFAHREN

(THE DEBATED QUESTION OF THE DIRECT DISCOVERY OF OIL DEPOSITS WITH THE AID OF ELECTRICAL METHODS OF PROSPECTING)

By H. Hunkel

Petrol. Ztschr. Jahrg. 25, Bd. 10, 1928, Berlin, pp. 293-3081

Geophysical prospecting for oil deposits based on bad electric conductivity of oil, by using electric methods, have led to a contradictory opinion on the possibility of direct discovery. The possibility of the direct discovery of oil is denied by some geophysicists (R. Ambronn, K. Sundberg), while another group (N. Gella, J. Koenigsberger, R. Krahmann) is of the opposite opinion, supporting it by theoretical conclusions, as well as by publication of the results of their investigations.

Hunkel sums up his article as follows:

"R. Ambronn's argumentation by which he denies the possibility of a direct discovery of oil deposits by means of electrical prospecting is untenable owing to several reasons.

"J. Koenigsberger's attempt to prove this possibility theoretically results in a series of statements only.

"It can rather be shown that the electric disturbances caused by the underground deposits of good or poor conductivity are very different and that no perceptible effects can be produced on the surface of the earth by oil horizons under the usual natural conditions and the sensitiveness of the present time measurement instruments. Therefore the experimental researches published as a proof of the possibility of a direct discovery of oil by electric methods of prospecting, as well as the interpretation of the data of these researches, must be considered a failure.

"These publications, even without taking into consideration the theoretical conclusions, may be considered to be either insignificant or proving just the contrary of that which they try to prove.

"The anomalies in the movement of the current observed, as shown in the examples mentioned, can easily be explained by the presence underground of bodies with better electric conductivity.

Hunkel's article provoked polemics between him and N. Gella, which are published in the same number of the Petroleum Zeitschrift, and, being of a critical nature, are very interesting as they may serve to throw light in general on the question discussed. -- W. Ayvazoglou.

EIN QUANTITATIVES ELEKTROMAGNETISCHES MESSVERFAHREN ZUR BESTIMMUNG DER TIEFE UND DES EINFALLENS VON ERZGÄNGEN VON DER OBERFLÄCHE AUS

(THE QUANTITATIVE ELECTROMAGNETIC PROCEEDING OF MEASUREMENTS FOR THE DETERMINATION, FROM THE SURFACE OF THE EARTH, OF THE DEPTH AND DIP OF ORE LODES)

By Max Müller

Gerland Beiträge zur Geophysik, Bd. 21, Heft 2/3, 1929, Leipzig, pp. 234-269.

1. The geological conditions of the examined area are described.

2. An apparatus is described which permits quantitative measurement, free from individual influences, of a magnetic field charged with alternating current interlinked with layers of earth.

3. At Bleialf in the Eifel district three components of the magnetic field vertical to each other were measured above a lode the size of which, at a depth of 95 meters, was at least 10 to 30 centimeters. The curves show distinctive change of intensity in passing over the conducting lode. Further, the inclinations of the magnetic vectors have been ascertained in three planes vertical to each other.

4. The constituents of the magnetic field and its components have been estimated in three directions vertical to each other.

a. The relative conditions of the distribution of the components of the magnetic field and of the layer charged with current,

of its depth, its dip, and its boundaries, have been calculated.

The following criterions were used: The relation of the maxima of the vertical and horizontal components, the distance of the intersecting point of the intensity distribution curves from the maxima, and the inclinations of the magnetic vectors.

Formulas are given for estimating the components of the magnetic field of the current of the current traveling outside of the layer in the semifield in three directions vertical to each other under the consideration of diminishing of the current density in the direction of the depth and the outer zones of the flux field. It is shown that slate may be considered, with regard to electric current, an anisotropic medium. In connection therewith it is shown that in simple cases the tectonic of the underground can be established by means of three components of the magnetic field, vertical to each other.

5. It is shown how the resulting fields may be established by superposition of the various component parts of the magnetic field

The estimated curves are in an approximate conformity with the measured ones. -- Author's abstract.

SOME PRACTICAL RESULTS OF ELECTRICAL PROSPECTING FOR ORE

By Karl Sundberg and Hans Lundberg

Institution of Mining and Metallurgy, No. 296, May, 1929, London, pp. 1-18.

(This is a paper discussed at a meeting of the Institution of Mining and Metallurgy held at the rooms of the Geological Society, Burlington House, Piccadilly W., on Thursday, April 18, 1929. Extra copies of this paper may be obtained at a cost of 1 s.od. each, at the Office of the Institution, Cleveland House, 225, City Road, London E.C.I.)

In the first part of the article, "Introduction", the authors give a brief outline on the general problem in electrical prospecting for ore. The procedure of solving this problem comprises two steps, namely:

1. Energization (galvanic and inductive methods);

2. Study of current distribution (investigation of the electric or the magnetic field, mapping of equipotential lines).

A summary of the general classification of electrical prospecting methods is given in Table I.

The second chapter, "Practical Results in Sweden", deals with geophysi- l prospecting methods used in that country for discovering ore deposits.

A map of Sweden showing the four ore-bearing districts of importance given. Two of them, that of Northern Lapland or Norrbotten and Central eden or Bergsladen, containing both iron and sulphide ores have been known om ancient times, and the electrical prospecting has been used in these dis- icts only recently. The two other ore-bearing districts, the Skellefte dis- ict and the Västerbotten Mountains, have been discovered essentially by means the electrical prospecting in conjunction with geological investigations. by contain sulphide ores almost exclusively.

The description of the districts and the different types of the ore s enumerated, those having commercial value being mentioned especially.

Electrical prospecting has been carried out on a large scale in Väster- tten since 1918, and as a result a new ore district has been discovered.

The names of the new fields, the approximate area of the ore bodies, l the character of the ore are given in Table II. Typical results of elec- ical work, checked by later drilling, are shown in two figures. Electrical ications and results of drillings made in 1924-1925 in the Boliden ore eld are shown on a map. The production has already started, and a smelting ant for Boliden ore is now being erected at Skellefte in Sweden and will be operation next year. The plan is to mine 120,000 tons of ore each year, ich will give 60,000 tons of pyrite with an average of 45 per cent S and ,000 tons of ore for the smelting plant, which will produce about 1,200 tons copper, 600 kg. of gold, and later 5,000 tons of arsenic, annually.

In the third chapter, "Prospecting for Molybdenite at Questa, New xico", the authors describe the region investigated by electrical methods prospecting in 1927. Numerous veins are mentioned, the types most frequent- represented being:

1. Veins containing molybdenite alone.

2. Veins containing other sulphides with little or no molybdenum.

3. Veins containing limonite and other oxidation products.

typical example of the electrical results is given, in which are shown in ction: the dip of polarization plane, amplitude of the in-phase (real) and rts of the horizontal and vertical field components.

Based on the results obtained by this survey the authors conclude as the possibility of using electromagnetic prospecting for finding small ins with poor conductivity on an area of very rugged topography.

Chapter IV: "Prospecting in Newfoundland". The area prospected was at of Buchan's mine, about 5 miles north of Red Indian Lake, and in the mer of 1926 valuable ore bodies were discovered by electrical methods of rospecting. The equipotential method was found to be the most applicable,

both for reconnaissance survey and for detailed work. In surveying lake areas during the winter electromagnetic methods were used.

The conditions for electrical prospecting were very favorable, as the ore bodies occur in zones of mineralization which are slightly conductive and thus capable of being traced electrically. Two large groups, the "Oriental" and the "Lucky Strike", were discovered.

The ore reserves at Buchan's now amount to 5,750,000 tons with an average assay value of gold 0.33 oz.; silver, 3.25 oz.; copper 1.4 per cent; lead 7.65 per cent; and zinc 17.85 per cent.

After the discovery of Lucky Strike nearly all exploration work was concentrated there. A mill and a power plant were constructed, and a railroad 23 miles long was completed, connecting the mine with the Newfoundland Government railroad.

In conclusion, the authors are of the opinion that the value and usefulness of electrical prospecting have been abundantly proved in this district and that it is doubtful whether these important ore bodies would ever have been located without this method. -- W. Ayvazoglou.

REPORT OF VISIT TO GERMANY DURING THE WINTER OF 1927-28

(In Russian)

By A. Petrowsky

Gorny Journal (Mining Journal) vol. 9, 1928, Moscow, U.S.S.R., pp. 694-653.

This is a very interesting report by Professor Petrowsky, director of the electrometric section of the Institute of Practical Geophysics, of his visit to Germany made to obtain information on the following questions:

1. The general status of electrometric methods of prospecting;

2. Instruments used for this prospecting;

3. Theoretical and experimental achievements in this domain;

4. Methods of working out the data of observations obtained;

5. The teaching and literature.

The establishment of personal relations with specialists working in the domain of geophysical prospecting (especially electrical) may be included in the purposes of the visit.

1. Petrowsky mentions the previous defective general conditions of geophysical prospecting and states that public opinion in Germany on the

eophysical prospecting has greatly changed in the last two or three years in avor of this prospecting.

2. A series of new instruments manufactured by different firms in ermany has been examined by Petrowsky and a brief opinion of them is given.

3. Theoretical work is concentrated in Germany mainly in three places: reiburg - Profs. Königsberger and Jensen; Berlin - Dr. Hummel; and Göttingen, Dr. Ambronn, who, according to Petrowsky's opinion, all attach great importnce to the theoretical work in connection with prospectting in the field.

4. In the domain of the experimental work and working out the data btained by observation, the Germans have made great progress. Petrowsky isited many firms and laboratories and gives his impressions on the work in hem. Large funds are already appropriated and the construction of a new buildng for the Institute of Oscillations in which not only the Government but also rivate firms take part has already been started. At the head of this institute will be put Prof. Wagner, president of the Henry Hertz Co.

5. Teaching and books: Lectures on geophysics are already being delivered in the Technical High School at Charlottenburg by Prof. Angenheister, n the University of Leipzig by Prof. Weikman, and in the University of öttingen by Prof. Zahlfeld. Lectures on geophysical methods of prospecting ere to be started in the Freiburg Berg Academy from the autumn of 1928 on. ew books are appearing in Germany constantly. Some of them are given special ention in the report. -- W. Ayvazoglou.

5 - RADIOACTIVE METHODS

THE NATURE OF THE PENETRATING RADIATION

By Dr. W. Bothe and Prof. W. Kolhörster

Nature, April 27, 1929, p. 638.

Up to the present the theory that the penetrating radiation consists f short gamma rays has been prevalent chiefly because the large penetrating ower these rays possess is associated with radiations of gamma-ray type. ur recent experiments, however, indicate that this radiation is of corpuscuar nature.

The experimental arrangement consisted simply of two "tube counters" f the type recently developed by Geiger and Müller (Die Naturwiss. Jahrg. 6, 1928, p. 615) which were placed above one another at some distance apart n a space screened by 6 cm. of lead and 5 cm. of iron.

Each of the counters was connected to an electrometer, and the deflections of the two electrometers, which were due chiefly to the penetrating adiation (Geiger, Physikalische Zeitschrift Jahrg. 29, 1928, p. 839) were egistered side by side on a moving film. With this arrangement a considerable

number of simultaneous deflections of both instruments was recorded. For small distances between the counters up to about 20 per cent of the total number of deflections of one counter were coincident pairs. This percentage is so great that it must be explained on the basis that coincidences occur if the same corpuscular ray enters both counters. Two hypotheses may be made concerning the origin of this corpuscular radiation. One is that the primary radiation may be of the gamma type and the coincidences are the result of secondary electrons. In this case one would expect the corpuscular rays to be absorbed more easily than the penetrating radiation that caused them. The alternative is that the penetrating radiation is really of corpuscular nature, in which case there should be agreement between the absorption co-efficient of the rays causing the coincident deflections and that directly measured for the penetrating radiation itself.

To distinguish between these alternatives, a block of gold 4.1 cm. thick was placed between the counters, the diminution in the number of coincidences thereby giving a measure of the absorption of the corpuscular rays.

The first attempts were made in a laboratory of the Reichsanstalt, where the thick floors and ceilings of the rooms above greatly hardened the radiation. There was no definite diminution in the number of coincident pairs under these conditions. The experiment was then repeated on the roof of the building with the lid of the screen removed. Under these conditions the unfiltered radiation from above acted directly on the counters, and a definite diminution in the number of coincidences was observed on introducing the gold block. The observed difference gives $(M/\rho)_{Au} = (3.6 \pm 0.5) \times 10^{-3}$ for the mass absorption coefficient. This value agrees well with that measured directly for the unfiltered cosmic rays. We conclude from these data that the penetrating radiation is not of gamma but of corpuscular type.

The complete description and discussion of these experiments will appear in the Zeitschrift für Physik. -- The Authors.

SOME DETERMINATIONS OF THE RADIOACTIVITY OF NATURAL GASES IN THE BAKU REGION

(In Russian)

By I. Cherepennikoff

Bull. Inst. Pract. Geophysics, vol. 1, pp. 277-278, 1925.

During an expedition in the vicinity of Baku in December and January, 1924-1925, made for the primary purpose of analyzing natural gases, several determinations of the radioactivity of these gases were carried out at the request of the Institute of Applied Geophysics.

These determinations were made by means of Schmidt's apparatus, calibrated by using a sample containing $3.31.10^{-9}$ grams of radium, or 9.56 Mache units. The gas container had a volume of 2950 c.c.

Four gases issuing from wells and one gas freely issuing on the surface of the earth were investigated. One of the wells was in the Biki-Eybat region (#5-50, depth 3060 feet); the other three were in the Surachan region a) #8-08, 1010 feet, (b) #5-33, 2850 feet, (c) #8-57, 1930 feet). The surface gas was taken from the top of the "Bog-Bog" mud volcano near Balachany village. The four gases taken from drillings showed a complete absence of any radioactivity. Indeed the falling of the electrometer leaves was delayed (as compared with readings in air) because the conditions of ionization are different in gases with complicated molecular structure. However, the gas from the mud volcano showed a radioactivity of 0.42 Mache units. One should also note that this gas had to be kept 1.5 hours in a storage container before measurements could be attempted so that the actual radioactivity might be expected to be still larger. This is also due to the fact that graduation of the apparatus was carried out with air and not with a carbohydrate gas. -- Translated by D.E. Olshevsky.

7 - UNCLASSIFIED METHODS

ACCOMPLISHMENTS IN THE DOMAIN OF APPLIED GEOPHYSICS

(In Russian)

By P. M. Nikiforov

Science and Technics, 1933, Leningrad, U.S.S.R., pp. 1-23.

Systematic study of the methods of applied geophysics began in the U.S.S.R. only in 1923 after the establishment of the Institute of Applied Geophysics. The literature on this question was scarce at that time, therefore the activity of the institute was directed toward the following three fundamental principles:

1. Theoretical examination of methods based on physical laws;

2. Verification of the theories established in laboratories and construction of intruments necessary for observation;

3. Verification of methods in the fields by sending expeditions to places important with regard to deposits.

Concerning the description of the accomplishments made during the last ten years the author divides the whole material according to the four main methods used in the U.S.S.R.: (1) Magnetiometric, (2) gravimetric, (3) electrical, and (4) radioactive.

1. After a brief description of the magnetometric method of prospecting in general and the work done in the U.S.S.R. since even 1914, Nikoforov mentions the results of the researches in some districts, as well as the instruments used for obtaining these results. According to his statement the researches in the regions of great magnetic anomalies resulted in many cases in the discovery of new deposits of iron ore.

2. The accomplishments in the gravimetric method of prospecting concern the study of theoretical conclusions and interpretation of the data obtained. The results must be considered successful, as the manner of working out the data is at the present time sufficiently simple so that geological maps may be drawn in the field almost at the same time that the observations are made. Instruments used for this method of prospecting were improved, and already in 1924 new instruments of the type of Eötvös torsion balance with photographic registration were constructed.

The instruments built in the U.S.S.R. are portable and simple in operation. Gravimetric data at 3 to 5 stations per day can be taken by these instruments, as compared with only one to two stations possible to be investigated by German instruments.

The new type of the graviometric variometer with short periods constructed by the author (see Geophysical abstracts No. 2, p. 10) makes it possible to obtain data at 10 to 20 stations a day. Diagrams showing to what degree the details of the distribution of the deposits can be established by the gravimetric method are given for comparison with diagrams drawn based on direct investigation.

3. Concerning the electrical method of prospecting, the author mentions especially the importance of the theoretical work accomplished by Prof. A. Petrowsky in this domain.

4. Finally, the accomplishment in the prospecting by using the radioactive method must be considered successful, as the cases in which this kind of prospecting shall be used are established.

The author mentions the names of scientists (Bogoyavlensky, Kirikov) by whom instruments necessary in the radioactive method of prospecting were constructed. -- W. Ayvazoglou.

GEOPHYSICAL SURVEYING

By W. H. Fordham, with discussion by W.R. MacDonald, S. J. Truscott, H. B. Bateman, D. C. Barton, Arthur Wade, H. Shaw and A. B. Edge

Jour. Inst. Petrol. Technol. (London), vol. 15, No. 72, Feb., 1929, pp. 35-80.

This paper is a review of the applied geophysical methods based on Fordham's personal experience and on a survey of the literature. A brief description of the instruments and a brief statement of the elementary theory of the various methods are given. The value of the methods in prospecting for oil is discussed. Estimates of the cost of geophysical surveys are given. A brief selected bibliography is appended. -- Donald C. Barton.

EARLY GEOPHYSICAL PROSPECTING

By William R. Jones

The Mining Magazine, vol. 40, No. 5, May, 1929, pp. 269-272.

This paper gives a historical resume of the British pioneers in early eophysical prospecting. Fox in 1830 and 1842 published papers on the natural lectric current connected with ore deposits. Bennets in 1833, Henwood in 341, and Hunt in 1841 and 1846 investigated natural earth currents in lodes. Anbuisson in 1801, von Trebra in 1818, Forbes in 1822, Fox in 1837 investiated geothermal gradients. Mallet was the father of the seismic method of rospecting, with his observations on difference of velocity of different ormations and use of explosions to produce elastic earth waves before 1851. ggerath in 1846 and J. F. Schmidt in 1858 proved the correctness of Mallet's neories. -- Donald C. Barton.

POTASSIUM

By Agustin Marin

Buletin del Instituto Geologico de Espana, vol. 8, 3d, ser., p. 328-409.

Chapter V of the book deals with geophysical methods of prospecting lt deposits.

General description of the following methods and the principles on ich the methods are based are given:

1. Gravitational method--valuable data on deposits may be obtained by establishing, by means of a torsion balance, gravitational anomalies;

2. Magnetic methods--differences in magnetization of ores determined by magnetometers;

3. Electric method--different electric conductivity of the rocks;

4. Seismic method--difference in propagation of elastic waves produced by shocks and their determination by seismographs;

5. Radioactive method--determination of the position of the ore bodies based on radio emanations;

6. Geothermic method--variations in the earth's crust established by thermal measurements.

As the choice of the special method to be applied in each case is diffilt, and in most cases even various methods supplementing one other are to be

used, the author recommends, based on his experience, that in case of investi gations of salt deposits the gravimetric and magnetometric methods should be applied in the first place for the following reasons; Valuable data on the position of the deposit may be obtained, owing to the great difference in density between the sodium and potasium salts and the rocks surrounding them, as well as owing to the great differences in magnetic permeability existing in salt regions.

The seismic and electric methods may in the opinion of the author be useful for the investigation of salt deposits but as these methods are still in the period of studying (1926) they are mentioned briefly only.

In conformity with the preference given to the first two methods, whic besides were used for investigation of salt deposits in Catalonia, the author described the methods more precisely.

Details of the Eötvös-Schweydar torsion balance, its adjustment for the field work, operation, calculation of formulas and working out of data are given. Photographic pictures of the balance, diagrams, and tables of data of observations are added.

Nikoforov's new type of gravitational variometer with short periods is mentioned besides.

Schmidt's vertical variometer used for the investigation of potassium deposits in Catlonia, the method of the operation of the apparatus, as well as the method of calculation the data obtained, are described.

In conclusion the author mentions that the tests performed by electric and seismic methods of prospecting in the salt deposits of North Germany for the determination of the constitution and form of these deposits will prove how far these methods may be applied in the future. -- W. Ayvazoglou.

8 - GEOLOGY

SUBJECTS WITHIN AND WITHOUT THE DOMAIN OF GOVERNMENT BUREAU INVESTIGATION

By Allen H. Rogers

Eng. and Min. Jour. vol. 127, No. 17, Apr. 27, 1929, pp. 682-683.

In this letter to the editor of the journal writer stresses the need for more knowledge of the physical characteristics of ores and rocks in the different mining areas rather than for attempted evaluations of competitive geophysical methods. -- Donald C. Barton.

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DEPARTMENT OF COMMERCE - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS [1]

No. 5

Compiled by Frederick W. Lee[2]

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1 - GRAVITATIONAL METHODS

DIE TOPOGRAPHISCHE REDUCTION BEI DREHWAGENBEOBACHTUNGEN

(CORRECTIONS OF OBSERVATIONS WITH RESPECT TO TOPOGRAPHY MADE BY MEANS OF A TORSION BALANCE)

By B. Numerov

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 117-134.

A numerical proceeding of corrections with respect to topography is worked out for places near the station and a graphical one for the remote parts of the terrain. The description is clear and very detailed. The numerical proceeding is very similar to that of the Eötvös and Schweydar methods which are in use already. In both methods the levelling is accomplished in certain circles and fixed azimuths around the station.

While, in using the Eötvös method, the height differences are directly inserted into the final formulas with regard to the foot of the instrument and in case of accurate formulas derived by Schweydar the height differences are calculated with respect to the center of gravity of the attachment, Numerov introduces functions A and B, the heights of the terrain and of the center of gravity, which are to be inserted into the formulas.

The formulas are calculated for the levelling in 8, 16, and 32 azimuths, and the functions A and B for the height of the center of gravity equal to 1 meter; in the Russian text of the article they are given in comprehensive tables ready for use.

In one of the columns the change of the value of the functions with regard to the change in the height of the center of gravity at 1 centimeter is given.

The tables added to the German translation of the article had unfortunately to be shortened greatly, owing to the lack of space. More work must probably be employed here than in using Eötvös' formulas; the amount of work is equal to that necessary in using Schweydar's method. The accuracy is equal to that of Schweydar's method.

The usefulness of the method is proved by a simple example which can be calculated directly also in a different way. For the graphic proceeding the terrain is divided by means of circles and radii into spaces. In all cases

hen the value of the height is constant the effect of every space on the nstrument is the same; therefore the reading only is required. If the value f the height is different the effect of each space must be multiplied by the actor which depends on the height of the terrain and the height of the cen- er of gravity. The representation of these factors is unfortunately not given n a table.

The division of the terrain into spaces is shown in two diagrams.--Trans- ation of K. Jung's abstract.

THE RELATION BETWEEN THE LOCAL ANOMALIES OF THE FORCE OF GRAVITY AND THE DERIVATIVES OF THE POTENTIAL (In Russian)

By B. V. Numerov

Reports of the Academy of Sciences of the U. S. S. R., January, 1929, pp. 101-105.

In this article Numerov derives formulas according to which the po- ential and its derivatives may be calculated if the distribution of the orce of gravity over a certain area is known. Of course, only differences f the derivatives of the potentials of points lying close one to another ay be found.

Of practical value are: The first derivatives of the potential of he disturbing mass; the second derivatives or the curvature gradients ob- erved by the aid of the gravitational variometer; and finally, $\frac{\partial^2 V}{\partial z^2}$ hich can not be determined by means of the variometer, but the knowledge of he value of which is very important for the interpretation of the gravita- ional observations.--W. Ayvazoglou.

BEMERKUNGEN ZUR NUMERISCHEN UND GRAPHISCHEN BEHANDLUNG DER KRÜMMUNGSGROSSE

(REMARKS CONCERNING THE NUMERICAL AND GRAPHIC TREATMENT OF THE CURVATURE VALUE)

By K. Jung

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 313-317.

The well-known formulas for the calculation of the curvature value from $\frac{\partial^2 u}{\partial x \partial y}$ and $\frac{\partial^2 u}{\partial y^2} - \frac{\partial^2 u}{\partial x^2}$ require in some cases very accurate additional means calculation if the accuracy of the result shall be equal to that of the data observation.

Here tha author gives a formula which is free from this disadvantage and derives a graphic method for addition, subtraction, and resolution of the components of the curvature values.

Graphical representation of the gradient and the curvature value, as used by Eötvös, is given in a figure. The gradient shows the direction and th amount of the greatest change of the force of gravity by moving in the horizon tal direction. The curvature value shows the difference of the two main curva tures of the surface of the level, as well as the direction of the smaller mai curvature.

The manner of carrying out the addition, subtraction, and resolution o components is shown in a figure.

The methods explained in the article can often be used in practice to great advantage. If a not too great accuracy is required, a trained drafts-man can use the graphic methods in drawing free-hand.

These methods are excellent for use whenever rapidity is more necessar than accuracy, as for example, during all kinds of rough calculations.-- W. Ayvazoglou.

A NEW GRAPHICAL METHOD FOR TORSION-BALANCE TOPOGRAPHIC CORRECTIONS AND INTERPRETATIONS

By C. A. Heiland

Bulletin of the American Association of Petroleum Geologists, vol 13, No. 1, 1929, pp. 39-75.

The graphical methods which have been suggested to date for the computation of topographic corrections and the effects of two--or three--dimensional geologic features involve mostly certain approximations. This makes it in many instances impossible to apply them to very steep topography or to abruptly changing subsurface structures. The approximations and the intricacies of the computations are due to the fact that either orthogonal or cylindrical coordinates are used. The author suggests a new method which is based on the use of spherical coordinates, the final formulas of which are very simple, and which does not involve approximations.

For sections made through any sort of terrain or subsurface structure in 16 azimuths, six diagrams are required. The construction of these diagrams is described.

They are applied (1) to the computation of topographic corrections and of corrections for mine openings in underground torsion-balance work; (2) to computations of the influence of two-and-three dimensional subterranean features in torsion-balance interpretation; (3) to computations of the influence of such structures on the magnetometer.--Author's abstract.

INTERPRETATION OF GRAVITATIONAL ANOMALIES

By H. Shaw

The American Institution of Mining and Metallurgical Engineers, Technical Publications No. 178,

The task of interpreting the results of observations obtained by means of the Eötvös torsion balance consists in disentangling the various subsurface anomalies, and subsequently in computing and recombining the effects of these various masses in order to verify the interpretation.

To render the calculations and consequent deduction applicable, certain fundamental assumptions are made and, except in special cases, are retained throughout. After having mentioned these preliminary assumptions and the quantities to be considered, the author divides his work as follows:

Part I. The infinite block:

a. Gradient characteristics: variation of maximum gradient with depth; position of maximum gradient; variation of gradient with distance from face of block; positions at which gradient attains definite values; gradient value at definite distance from edge; gradient interpretation.

b. Characteristics of differential curvature: analysis of differential curvature effects; variation of maximum curvature with depth; position of maximum curvature; variation of differential curvature with distance from face of block; curvature value at definite distance from edge; inclination of curvature curve over edge; differential curvature interpretation.

c. Comparison of gradient and curvature effects: ratio of maximum gradient to maximum curvature; intersection of gradient and curvature curves; relation between gradient and curvature values; equations of curves of gradient to curvature ratio; geometrical construction; combined gradient and curvature interpretation.

Part II. Infinite horizontal block with inclined face:

a. Gradient characteristics: value of maximum gradient; position of point of maximum gradient; variation of gradient with distance from edge; positions at which gradient attains definite values; gradient value at definite distances from edge; gradient interpretation.

b. Characteristics of differential curvature: determination of curvature value; maximum curvature values; position of maximum curvature; curvature interpretation.

c. Comparison of gradient and curvature effects: ratio of gradient to curvature; differentiation of gradient and curvature curves; practical example; combined gradient and curvature interpretation.

Part III. Variation of total gravity.

Forty-seven figures illustrate the work.--W. Ayvazoglou.

GRAVITY ANOMALIES AND PETROLEUM EXPLORATION BY THE GRAVITATIONAL PENDULUM

By M. K. Hubbert and Frank A. Melton

Bull. Am. Asso. of Petroleum Geol. vol. 12, No. 9, 1928, pp. 889-899.

The methods of comparing gravity data are discussed with regard to their usefulness for petroleum exploratory work. In flat plains of slight relief one anomaly may be used almost as satisfactorily as any other. However the "free-air" anomaly has the obvious advantage that it involves the least trouble in calculation. But in regions of considerable relief such as mountains and dissected plateaus, the only serviceable anomalies are the topographic and Bouguer anomalies. The latter is a satisfactory practical

bstitute for the former, which is difficult to compute. All the "isostatic" omalies are unsatisfactory in rugged topography on account of their assumpons regarding subsurface density conditions, to say nothing of the great fficulty of computation. The free-air anomaly is also unfit for such terines.--Author's abstract.

2 - MAGNETIC METHODS

UEBER DIE BEI LOKAL VERGLEICHENDEN MAGNETISCHEN MESSUNGEN DER VERTICALINTENSITÄT ANZUSTREBENDE GENAUIGKEIT

(ON THE ACCURACY TO BE STRIVEN FOR IN THE LOCAL COMPARATIVE MEASUREMENTS OF THE VERTICAL INTENSITY)

By J. Koenigsberger

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, pp. 236-245.

In taking earth-magnetic measurements over a fixed subsoil, for exame alluvium or gneiss, the measurements made at neighboring places differ a ttle one from another. This local heterogeneity of the subsoil was estabshed for distances of from 3 to 200 meters; it is almost of the same error, ual to ± 4 %, as the error of the results of two measurements taken at the me position in case of two different settings of the instruments.

Therefore, effects of another kind, for example, of the unevenness the terrain, which are greater than ± 4 % on the subsoil rocks examined n be established.--Author's abstract.

UR EMPFINDLICHKEITSBESTIMMUNG VON MAGNETISCHEN VARIOMETERN UND ZUR EICHUNG DER MAGNETISCHEN FELDER VON SPULEN

(DETERMINATION OF THE SENSITIVENESS OF MAGNETIC VARIOMETERS AND THE ADJUSTMENT OF THE MAGNETIC FIELDS OF COILS)

By J. Koenigsberger

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 151-153.

The author explains a simple proceeding for the adjustment of magnetic riometers by means of a compound coil through which a current flows. The rizontal and vertical intensity of the place in which the adjustment is made st be known to the extent of the percentage to which the graduations of the riometer are to be adjusted. In most cases an accuracy of from 1 to 2 per nt can be considered sufficient.--W. Avvazoglou.

67.

THE KURSK MAGNETIC ANOMALY

COLLECTION OF MAPS OF MAGNETIC ELEMENTS MEASURED UNDER THE GENERAL SUPERVISION OF P. LASAREFF

Published by Industrial editorship in Leningrad (Promisdat), 1927, Zeitschrift fuer geophysik, Jahrg. 4, 1928, Braunschweig, p. 136.

Twenty-seven maps of nine different places where the Kursk magnetic anomalies are observed, showing the declination, horizontal components, and vertical components of the intensity of the magnetic field, are included in the volume published. The scale of the maps is different, around 1:70000. The maps represent a reproduction of reduced working maps. They include the isomagnetic lines as well as the position of the points observed. (Note: The atlas can be obtained from: Moscow, 3. Muisskaya No. 3).--J. Ayvazoglou.

ERGEBNISSE VON DREHWAGENMESSUNGEN IN SCHESWIG-HOLSTEIN

(RESULTS OF TORSION-BALANCE MEASUREMENTS MADE IN SCHLESWIG HOLSTEIN)

By Karl Jung

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 395-400.

This article is an addition to the large work on the magnetic measurements of anomalies in North Germany.

Magnetic measurements in Schleswig-Holstein were already made and published by Dr. H. Reich in his article "Zur Frage der regionalen magnetischen Anomalien Deutschlands, insbesondere derjenigen Norddeutschlands (Ztschr. fuer Geophysik, Jahrg. 4, 1928, pp. 84-102)."

In connection with the latter a trip for gradient measurements with the Eötvös torsion balance was undertaken between Husum and Flensburg. The differences of the force of gravity calculated from the gradients were in general parallel to the anomaly of the magnetic vertical intensity. Based on rough calculations made for the determination of depth, the author supposes that the gradients were influenced by elevated ancient rocks by the pressure of which the magnetically effective main rock had served as an abutment.

Gradients of the force of gravity, values of curvatures, and the isa-
malies are given in a figure. The depth of the compact masses could not
established with great accuracy because the stations were not close enough
each other and the gradient picture was too much disturbed. Approximate
ta on the maximum depth could, of course, be established in some places.

The assumptions and the results are given in a table.--W. Ayvazoglou.

MAGNETISCHE ANOMALIEN IM WESTLICHEN MECKLENBURG

(MAGNETIC ANOMALIES IN WEST MECKLENBURG)
By Fr. Schuh
Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig,
pp. 304-313.

The article is a preliminary report showing a partial result of a
rger work which so far is not completed. The object of the future work
to draw a map of magnetic isanomalies of the whole state of Mecklenburg-
nwerin. This map of isanomalies is to serve as a basis for other geo-
ysical and geological investigations.

Schuh describes in this paper the measurements of the vertical in-
nsities made by him in the western part of Mecklenburg-Schwerin during
e period from Dec. 27, 1927, to January 19, 1928. The investigations
re made by Schmidt's field balance and the corresponding map of isanoma-
es was drawn. A regional anomaly in the northeastern direction was estab-
shed.

The amplitude of disturbance reached a value of about 270 δ. Three
fferent kinds of anomalies were established from the measurements made
the western part of Mecklenburg: (1) An anomaly affecting a large area
ich was connected with more or less great depth of the crystalline sub-
il; (2) anomalies caused by great tectonic disturbances which were es-
cially strong when the crystalline subsoil was affected by these tectonic
sturbances; and (3) anomalies appearing less strong, caused by the differ-
t susceptibilities of the sedimentary subsoil. The author tries to give
ological explanation of the causes of the regional, as well as of some local,
malies.--W. Ayvazoglou.

Inf. Cir. No. 6175.

A SIMPLE DERIVATION OF THE WORKING EQUATIONS OF MAGNETIC VARIOMETERS FOR VERTICAL AND HORIZONTAL INTENSITY

By Oliver C. Lester

Bull. Am. Asso. Petr. Geol., vol. 12, No. 8, August, 1928, pp. 855-860.

Derivations of the working equations of a local magnetic variometer in general use in the field are ordinarily based upon complicated theoretical considerations, the use of Lagrange's equations, etc.

These methods call for more theory than is generally at the command of persons using the instrument. The author presents a simple derivation involving nothing more than elementary physics.--Author's abstract.

THE DIP NEEDLE AS A GEOLOGICAL INSTRUMENT

By Noel H. Stearn

The American Institution of Mining and Metallurgical Engineers, Technical Publication No. 151, 1928, 19 pp.

After a detailed description of the principles of the dip needle, its construction, manipulation, and sensitivity, the author derives formulas with the aid of which the variation of the vertical intensity may be calculated from the variations in the inclination of the needle. A variation of 1° of the dip needle was produced by a variation of intensity ranging from 0.25 to 1 per cent, depending on the instrument. The average was slightly less than 0.5 per cent.

The sources of error in the use of the dip needle are divided by the author into three groups:

1. Those introduced by the actual manipulation of the needle,
2. Those introduced by mechanical defects, and
3. Those introduced by certain magnetic factors.

Manipulative sources of error may be caused:

a. By orienting the instrument; the results showed that it is necessary to vary the instrument about 20° from verticality and from 15 to 20° from parallelism with the plane of the magnetic meridian in order to vary the reading by 1°;

b. By taking the readings; the fact that the graduated scale is not in the same plane with the needle gives rise to the possibility of error due to parallax. This can amount to as much as 0.5, but can be minimized by careful readings.

Mechanical factors by which errors of much importance may be introduced are enumerated, and a list of tools which are to be carried in the field for the necessary repairs to the dip needle is given.

Magnetic sources of error are diurnal magnetic variation, magnetic storms, and static electrification of the glass face of the instrument.

The dip needle, then, is an instrument designed to measure the relative degrees of distortion in the earth's magnetic field caused by the differential permeability of the formations forming the earth's crust. Its sensitivity is sufficient to detect the variations caused by the ordinary concentrations of ferromagnetic minerals found in the earth's crust, but there exist certain mechanical and theoretical limits to its sensitivity. (Footnote in the article: "The new Hotchkiss Super-dip has overcome these limits, that it is capable of attaining theoretically infinite sensitivity.")

In conclusion the author gives an example of the results of the investigation accomplished with the dip needle in one of the iron districts of Upper Michigan in which a complicated structural situation exists.

The results of this investigation were later confirmed, thus the applicability of the dip needle as a geological instrument to one type of geological problem proved.--W. Ayvazoglou.

A BACKGROUND FOR THE APPLICATION OF GEOMAGNETICS TO EXPLORATION

By Noel H. Stearn

American Institute Mining and Metallurgical Engineers, Technical Publication No. 150, 1928, 28 pp.

The author describes briefly the phenomenon of terrestrial magnetism and gives a general view on the influence of the geologic and topographic conditions of the earth's crust on the terrestrial magnetic field. After having classified the minerals as diamagnetic, paramagnetic, or ferromagnetic, according to the type and intensity of the reaction which they display, Stearn discusses the effect of these properties of the rocks with regard to their application for exploration. The influence of the neighboring strata having a different capability for being magnetized is examined. The instruments used for the measurement of the magnetic field are mentioned. The author concludes: "An extensive body of empirical data is being built up for the practical application of the geomagnetic method of exploration through the use of various instruments, but since much of this work is still held confidential, the impossibility of assembling it for a back sight for future guidance is obvious.

"Heretofore it has been impossible to predict much regarding the possible results to be expected in new applications of the method. Fortunately the method is sufficiently economical in application that it usually pays to try it out in a problematical case. But some logical basis for a prediction of its applicability has been the grail in quest of which most of those interested in geomagnetics have sent many thoughts. An approach to such a basis of prediction bids fair to lie in tabulating either the specific or relative permeabilities of all common rocks, and work along this line is now actively progressing. Another desirable advantage would be in the devising of a simple apparatus whereby the permeabilities of rock specimens could be obtained quickly. This too, is now receiving attention."--W. Ayvazoglou.

3 - SEISMIC METHODS

A NEW SEISMOMETER EQUIPPED FOR ELECTROMAGNETIC DAMPING AND ELECTROMAGNETIC AND OPTICAL MAGNIFICATION (THEORY, GENERAL DESIGN, AND PRELIMINARY RESULTS)

By Frank Wenner

Bureau of Standards Journal of Research, vol. 2, May, 1929, pp. 963-999.

An elementary discussion is given of the principles involved in the functioning of seismometers equipped for electromagnetic damping and electromagnetic and optical magnification. These principles are then used in the development of an equation giving the relation between angular displacement of the winding of the galvanometer and the linear displacement of the ground. This equation, which is a linear differential equation of the fourth order, contains terms representing the reaction of the galvanometer upon the motion of the steady mass of the seismometer, a point which has previously been neglected and which is of importance unless the seismometer is made much larger than that for which there is any real need. A solution of this equation is given for the case of a sustained harmonic displacement of the ground. Also the corresponding equation and solution are given for the case of tilting of a horizontal-component instrument.

A procedure which may be followed in the development of a general design for a seismometer, to give approximately a specified performance, is illustrated by a concrete example. In this design the steady mass is about 500 grams; the arrangement is such that the period may be determined and the damping adjusted from the recording station, which may be at a distance from the seismometer; and the magnification and its variation with the period of earth displacements, in the range from 2.5 to 60 seconds, is substantially the same as is given by a seismometer of the ordinary type having a magnification for short-period displacements of 1,250, a period of 12.5 seconds, and critical damping.

Preliminary results obtained with an experimental seismometer constructed substantially in accordance with this design are given, and a photograph of the instrument is shown.--Author's abstract.

MODERN INSTRUMENTS AND METHODS OF SEISMIC PROSPECTING

By C. A. Heiland

American Institution of Mining and Metallurgical Engineers, Technical Publication No. 149, 1928, 19 pp.

After a brief historical review of the seismic method of prospecting, eiland gives a description of Schewydar's two-component seismograph and the ethod of its operation. A résumé of formulas and methods used in the interretation of seismograms is given. The travel-time curves and their importnce are discussed and fundamental formulas of the course of elastic waves n case of vertical, horizontal, or inclined layers are derived. Heiland lassifies the interpretation of travel-time curves in three groups:

1. Impulses due to directly arriving and refracted waves;
2. Impulses due to reflected waves;
3. Impulses due to transmission of the tremor through oscillation of the lower layers.

As it is of very great practical importance to know for which geologic roblem the formulas using the laws of refraction or the formulas based on he assumption of independent layer-oscillations should be applied, the author s of the opinion that a distinction should be possible by the observation of ngles of emergence according to Schweydar's investigation.--W. Ayvazoglou.

4 - ELECTRICAL METHODS

DER GEGENWÄRTIGE STAND DER ELEKTRISCHEN GEOPHYSIKALISCHEN METHODEN

(THE PRESENT STATUS OF ELECTRIC GEOPHYSICAL METHODS)

By W. Heine

Metall und Erz. XXV, vol. 10, 1928, pp. 238-242.

Heine gives a picture of the present status of electric methods of eophysical prospecting drawn from the main publications which have appeared

up to this time. The following methods are discussed: 1. Methods of potential lines and potential measurement: 2. electromagnetic methods: 3. methods of phase measurements: 4. methods of current transmission: and 5. electric waves. The possibility of the use of the electric methods for porspecting oil are mentioned.--W. Ayvazoglou.

ZUR THEORIE ELEKTRISCHER BODENFORSCHUNG

(CONCERNING THE THEORY OF ELECTRICAL PROSPECTING)

By W. Heine

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 109-112.

Heine calls attention to the errors in formulas calculated with regard to the theory of electrical prospecting by the following authors:

1. R. Ambronn, in his article "Einige Bemerkungen zur Möglichkeit der Aufsuchung und Lokalisierung von schlecht oder nicht leitenden Wechselstrommethoden." (Zeitschrift fuer Geophysik, 3 1927, vol. 3 5).

2. Sundberg, Lundberg, and Eklund, in their article "Electrical Prospecting in Sweden."

3. Debye, in his article "Stationäre und quasistationäre Felder" (Enzyklopadie der mathematschen Wissenschaften. V, 17, p. 415).

4. Gibsone, in his work which appeared in the Zeitschrift fuer Geophysik 3, 1927 vol. 5.

5. The author himself, in his article "Die Einflusse von Induktion und Kapazität bei geophysikalischen Potentiallinien Messungen mit Wechselstro (Physikalische Zeitschrift, 1926, p. 219).--W. Ayvazoglou.

NOTE ON AN ELECTRICAL INVESTIGATION FOR COPPER ORES IN ROUMANIA

By Norbert Gelle and H. Bertram Bateman

A paper discussed at a meeting of the Institution of Mining and Metallurgy, London, April, 1929.

The area investigated is situated in eastern Roumania. The copper ores in this field were worked by Germany during the war and further exploitation is now being undertaken by a Roumanian company.

The ore is copper pyrites and occurs in varying degrees of concentra-
on in the form of irregular pipes at or near the junction between the two
ate formations.

A considerable difference in the electrical conductivity between the
e masses and the surrounding country indicated that the geoelectrical method
uld be suitable for this investigation.

The problem was to locate the extension of the ore body known already,
well as to locate further ore bodies in the neighborhood, if any such
isted.

The results of the electrical indications are given in seven figures
owing:

1. The line of junction between the two slate formations;
2. Plan of the first area investigated;
3. Section on main ore body;
4. Section at shaft No 3;
5. Position of electrodes for observation, in plan and section;
6. Current line diagram, electrode position No. 22;
7. Current line diagram, electrode position No. 17.

(Note: Extra copies of this paper may be obtained at a cost of 1 s.
d. each, at the offices of the Institution, Cleveland House, 225, City
ad, London, E. C. I).--T. Ayvazoglou.

NOTE ON AN ELECTRICAL AND MAGNETIC INVESTIGATION FOR MAGNETITE ORES, NORTH SWEDEN

By Norbert Gella and H. Bertram Bateman

A paper discussed at a meeting of the Institution of Mining and Metallurgy, London, April, 1929.

A survey of the area discussed had already been carried out by the
agnetic method of investigation since 1904. As the ore was an excellent
lectrical conductor in comparison with the country rock, the electromagnetic
ethod was recently employed for the determination of the size of the ore
odies, as well as their extension in depth, in order to establish their
ommercial value.

A general plan of the area is given in a figure. Variations in the magnetic field are shown by means of the lines of equal vertical intensity, and the positions of certain selected profiles are drawn. Curves for vertical intensity, as well as the curve of distortion in the declination and that of the variations in horizontal intensity, are given.

The inductive electrical method was employed:

1. To determine if the ore goes down to a greater depth;
2. To find approximately at what depth it occurs; and
3. To arrive at some approximation as to the width of the lense.

The results of the observations made by the inductive method had shown that the ore was near the surface and that the lenses vary in depth from 30 meters to 100 meters.

Diamond drilling was employed to test the results of the survey. The results demonstrated the conclusions arrived at from the interpretation of the geoelectrical survey; namely, that the ore bodies did not extend in depth and that they narrowed consistently from the surface downward.

(Note: Extra copies of this paper may be obtained at a cost of 1s. 0 d. each, at the offices of the Institution, Cleveland House, 225 City Road, London, E. C. 1.)--W. Ayvazoglou.

EIN ELEKTROMAGNETISCHES MESSVERFAHREN ZUR ERFORSCHUNG DES STROMVERLAUFS EINES DEM ERDBODEN MITTELS ZWEIER ELEKTRODEN ZUGEFÜHRTEN WECHSELSTROMES

(AN ELECTROMAGNETIC MEASUREMENT PROCEEDING FOR THE INVESTIGATION OF THE COURSE OF THE CURRENT OF AN ALTERNATING CURRENT CONDUCTED INTO THE GROUND BY MEANS OF TWO ELECTRODES)

By H. Haalck

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 405-413

In employing the electromagnetic methods of prospecting, the fact that the current which passes through the line greatly affects the measurements must be considered very important; thus its influence in the receiving instruments can not be neglected and must either be eliminated or taken

to account in calculations. To avoid this influence the author proposes make the measurements along the profiles parallel to the basis of the ectrodes; besides, the intensity of the currents in both branches of the ne must be brought, by the aid of adjustable resistances, into such a lation that the influence of the line for a certain profile is balanced. the article the author explains how with the aid of different arrangents in the line on the terrain the intensity and direction of the magnetic ield caused by the earth current only can be measured and calculated.

The measurement proceeding is given in a practical example. The rticle is illustrated by seven pictures.--W. Ayvazoglou.

5 - RADIOACTIVE METHODS

MÄCHTIGKEITSBESTIMMUNG VON DECKSCHICHTEN ÜBER SPALTEN DURCH RADIOACTIVITÄTS-MESSUNGEN.

(DETERMINATION OF THE THICKNESS OF THE COVERING LAYERS OVER FISSURES BY MEANS OF RADIOACTIVE MEASUREMENTS)

By J. Koenigsberger

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 76-83.

Based on the well-known fact that the ionization of the air by the diation of radium emanation above tectonic fissures is greater than above ther places, it may be concluded that the thickness of the covering layer f different kinds (humus, alluvium, delivium, etc.) can be established from he form of the curve by which the dependency of the ionization on the ocality is represented.

A simplified theory for the mathematical solution of the problem s developed; several examples by which the application of the theory is xplained are given.--Author's abstract.

ÜBER "RADIO-EMANATOR" UND SEINE ANGEBLICHEN WISSENSCHAFTLICHEN GRUNDLAGEN

(RADIO-EMANATOR AND ITS ALLEGED SCIENTIFIC FOUNDATION)

By H. Hunkel

Metall und Erz. XXV, vol. 9, 1928, pp. 204-206.

In a preliminary remark Hunkel says: "In taking up the disagreeble task of submitting to criticism the radio-emanator, as well as its

alleged scientific foundation and work announced in a series of publications, I comply only with the desire of mining circles addressed to me. Questions from the home and foreign countries, as well as the new propaganda publications issued by the "Wirtschaftliche Gewerkschaft Bertle II, Dortmund," show that this criticism answers the current public interest."

In the article the author gives a description and a schematic picture of the radio-emanator constructed by the engineer W. Foster of Leipzig.

The manner of working of the apparatus is explained and its scientific foundation examined. The result of the examination is summed up by Dr. Hunkel as follows:

"In reality the radio-emanator has absolutely nothing to do with the physical phenomena on which the apparatus is supposed to be based.

"The apparatus may possibly be called a divining-rod only which, owing to its fastening to a vertical axis of rotation can be rotated by the slightest difference in inclination of the axis or by means of slight bearings of the supporting frame."--W. Ayvazoglou.

RADIOACTIVE ATMOSPHERICAL METHOD OF MEASUREMENT FOR GEOPHYSICAL PROSPECTING

By Andrew V. Corry

The American Institution of Mining and Metallurgical Engineers, Technical Publication No. 200,

After a brief introduction in which the author mentions the distribution of radioactive substances in rocks (uranium, thorium), waters and gases in the earth's crust, and refers to the means and units serving for analyzing unknown radioactive substances, he gives a description and a schematic picture of Ambronn's apparatus for measuring emanation content, and examines the method of measuring to be applied for geophysical prospecting.

Cross profiles at right angles to the supposed course of the vein are made by radioactive measurements of their emanation contents in order to detect ores bearing uranium, thorium, and radium-bearing ores. These may be made along a drift, in a shaft, or by floor samples directly under the surface

The mean radium and thorium content of the rocks upper strata of the rth is estimated to be 2 by 10 - 12 G. per gram.

Arrhenius made excellent sample tests, employing this method in his ory of an oil south near Celle; at Hamburg other tests were made of a tural gas well. Radium lines have been noted near Bludenz, as are also e increase of alpha rays being noted in the evaporations of the immediate ority. Successful cases of investigation in France where the method s been used are known also. The Elwof Prospektiel Co. of London, employ its methods to the location of certain silver-lead lodes, etc. The apparatus ed by the Elwof Co. is similar to that described in this article.--W. rzoglio.

V - GEOPHYSICAL METHODS

THE PRACTICAL APPLICATION OF GEOPHYSIKALISCHEN METHODEN IN BERGBAU UND HÜTTENWESEN

(PRACTICAL APPLICATION OF GEOPHYSICAL METHODS IN THE MINING INDUSTRY AT HOME AND ABROAD)

By Prof. Dr. Teigelt

Metall und Erz. XIV, vol. 4, 1922, pp. 82-92.

In a lecture delivered at a general meeting of the Association of rman Metallurgical and Mining Engineers, Dr. Teigelt discussed the ques- on of practical application of geophysical methods of prospecting at home d abroad. According to his words applied geophysics occupies in the German ning industry, if compared with other countries, a subordinate place only. e participation of German scientists in this work abroad, especially in e United States of America is, of course, very great. The best results e so far obtained in comparatively large areas of shield-shaped masses on the e land and large basins and plains filled with young sediments on the ast.

A predominant position has been reached by the applied geophysics the last years in the oil industry. The author mentions especially the ults obtained in the Gulf-coast plain of Texas and Louisiana in which llions of acres were investigated and oil deposits were discovered. In rope considerable work has been done in the Vienna basin.

A detailed list of geophysical literature showing the progress of is science is added.—W. Arrazoglou.

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DEPARTMENT OF COMMERCE - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 6

Compiled by Frederick W. Lee

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Supervising engineer, geophysical section, U. S. Bureau of Mines.

25.

Inf. Cir. No. 6203.

This circular contains a brief summary by F. W. Lee of some of the dom tic patents issued from the United States Patent Office. It may serve as a gu for a preliminary search on new inventions and also show the history as well a the trend of the art.

1- GRAVITATIONAL METHODS

1,617,823 Patented Feb. 15, 192

EÖTVÖS TORSION BALANCE

Stephen Rybár, of Budapest, Hungary

Patent discloses a method of reducing the size of the torsion balance reducing the torsion wire diameter below .02 millimeter and the beam and lengt of wire from the size in the normal balance of 40 and 50 centimeters, respecti ly, by the cube root of the fourth power of the ratio between .02 millimeter a the diameter of the reduced wire, whereby the sensitivity of the balance remai unchanged.

Claims allowed - 1.

1,579,273 Patented April 6, 192

APPARATUS FOR THE MEASUREMENT OF THE VARIATIONS IN THE FORCE OF GRAVITY

Frederick Eugene Wright of Washington, D. C., assignor to Carnegie Institution of Washington

Patent discloses a method for the direct determination of the force of gravity or variations thereof by measuring the torsion of two nonperiodic tape helical suspensions. Very slight variations of gravity are measured by a thre image optical system embodied in the design.

Claims allowed - 13.

1,652,255 Patented Dec. 13, 192

GRAVITATION METER FOR MEASURING THE VERTICAL GRADIENT OF THE GRAVITY OF THE EARTH

Wilheim Schweydar, of Potsdam, Germany

Patent discloses a method of measuring the vertical gravity gradient b comparing the bifilar turning moment with the torsional component of a helical spring. By adjusting the position of a counterpoise, two indications are made at different distances from the earth's center.

Claims allowed - 3.

570,310 Patented May 22, 1928

TORSION BALANCE

Robert H. Miller, of Houston, Tex.

Patent discloses improvements in the torsion balance by reducing the time oscillations by eddy-current damping in a hollow silver cylinder forming an ial extension of the torsion suspension. Suitable arrangements have been de- ribed for obtaining an axial magnetic field from an electromagnet.

Claims allowed - 10.

684,229 Patented Sept. 11, 1928

MEASURING INSTRUMENT (TORSION BALANCE)

Johann Koenigsberger, of Freiburg, Germany

Patent discloses a damped system on a torsion balance. The device con- sts of a moving element in a damping liquid with the wire passing through the nter of the liquid surface. The moving element consists of a plurality of cs, and the wire supporting the same is of small diameter.

Claims allowed - 4.

2- MAGNETIC METHODS

,298 Patented June 14, 1910

PROSPECTOR'S NEEDLE

Dell W. Jewell, of Kalamazoo, Mich.

Patent discloses a balanced dip needle capable of being deflected in ximity of magnetic minerals. A circuit arrangement is provided for closing ontact and lighting a lamp upon deflection of the needle, which also can be ered into shafts and drill holes.

Claims allowed - 2.

3- SEISMIC METHODS

,540 Patented Aug. 8, 1905

ECHO - DISTANCE METER

John Sutherland, of Seattle, Wash.

Patent discloses method of recording distance directly, using sound and echo thereof. It is partly manually operated, but contains very many im- tant details embodied in the claims useful to this art.

Claims allowed - 13.

844,838 Patented Feb. 19, 190?

DEVICE FOR REGISTERING VIBRATION OF MUSICAL SOUNDS

Lewis R. Wheeler, of Tacoma, Wash.

Patent discloses method of sound registration using carbon button microphone. A balanced torque method of equilibrium position is used on the pointer in combination with an inductorium.

Claims allowed - 3.

1,082,014 Patented Dec. 23, 191?

MEANS FOR MEASURING, INDICATING, AND RECORDING VIBRATIONS

W. P. Digby, P. W. Beatty, and A. C. Huskinson

Patent discloses a method of using a liquid surface in conjunction with a reflector for recording vibrations. The mirror floats on the surface of the liquid, and provisions are made for photographic registration. The method was intended for measuring vibrations in machines.

Claims allowed - 3.

1,095,022 Patented April 28, 191?

SEISMOGRAPH

Thomas O'Brien, of Brooklyn, N. Y.

Patent discloses a portable seismograph for recording vibrations of buildings, bridges, etc. Combines the recording, by single pendulum, of the vertical and horizontal vibrations independently from each other. Mechanical levers are used for amplification of movement.

Claims allowed - 9.

1,149,976 Patented Aug. 10, 191?

METHOD FOR LOCATING SOUNDS

Henry J. Furber, jr., of Chicago, Ill.

Patent discloses method of determining the source of sound from stations located at different distances from each other. Uses oscillographic recording methods and single vibratory impulse as basis of comparison.

Claims allowed - 4.

194,376 Patented Aug. 15, 1916

APPARATUS FOR ASCERTAINING THE RELATIVE LOCATIONS OF DISTANT POINTS

Henry J. Furber, jr., of Chicago, Ill.

Patent discloses a method of recording a distance by the difference of locity in two mediums between two points. Two separate receivers are used in e two media. Oscillographic recording is applied.

Claims allowed - 4.

240,328 Patented Sept. 18, 1917

METHOD AND APPARATUS FOR LOCATING ORE BODIES

Reginald A. Fessenden, of Brookline, Mass., assignor to Submarine Signal Co.

Patent discloses a method of locating ore bodies by "sound inflection," at is, bending of the line of sound by refraction or reflection. The time-stance relation is the basis of observation, as well as the direction of the ind.

Claims allowed - 2.

341,795 Patented June 1, 1920

LOCATING ENEMY GUN POSITIONS

Reginald A. Fessenden, of Brookline, Mass., assignor to Submarine Signal Co.

Patent discloses a predetermined disposition of a plurality of sonic re-iving apparatus, locating by travel-time diagrams the position of a gun. The re sounds are identified by oscillographic registration.

Claims allowed - 2.

450,246 Patented April 3, 1923

PIEZO-ELECTRIC RESONATOR

Walter G. Cady, of Middletown, Conn.

Patent discloses the elemental reactions in an electric circuit of a ezo-electric crystal or resonator. It also gives a description of a simple cillator valve circuit adjusted by crystal frequency.

Claims allowed - 6.

25.

1,451,080 Patented April 10, 19

FIELD SEISMOGRAPH

Ludger Mintrop, of Hanover, Germany

Patent discloses oscillatably supported weight combined with a comparatively light-weighted lever, a rockingly supported mirror, a means for damping oscillations by oil or magnetically, and a source of light suitably arranged for registering photographically the amount of relative motion of the weight and supports. Complete system of stopping and release mechanism is also specified, as well as a return to the same zero position.

Claims allowed - 11.

1,472,583 Patented Oct. 30, 192

METHOD OF MAINTAINING ELECTRIC CURRENTS OF CONSTANT FREQUENCY

Walter G. Cady, of Middletown, Conn.

Patent discloses the use of a crystal in a vacuum-tube oscillator circuit for controlling the frequency of the circuit. The characteristic curves associated with this device are described.

Claims allowed -

1,483,547 Patented Feb. 12, 192

METHOD OF DETERMINING DISTANCES

Harvey C. Hayes, of New London, Conn., assignor to Submarine Signal Co.

Patent discloses a method of depth-sounding by generating sound at a known position and determining at another known position the angle of incidenc reflected from the bottom. The amount of shelving or slope of the bottom can determined from two sets of apparatus properly placed.

Claims allowed - 9.

1,532,108 Patented March 31, 19

DETERMINATION OF WAVE-ENERGY DIRECTION

Harvey C. Hayes, of New London, Conn., assignor to Submarine Signal Co.

Patent discloses a system of receivers arrayed in a circle. A binaura system connects to definite groups of these receivers. Provision is made for

e lag in the separate receivers and also for a rotatable means of connecting the system of receivers to determine the direction of the wave.

Claims allowed - 4.

561,441 Patented Nov. 10, 1925

APPARATUS FOR DIRECTIVE SIGNALING

Reginald A. Fessenden, of Newton, Mass., assignor to Submarine Signal Co.

Patent discloses the binaural method of determining the direction of the urce of sound. The difference in phase may be equalized either electrically the two circuits or by turning the two separate receivers about a common axis.

Claims allowed - 10.

581,334 Patented April 20, 1926

VIBRATION-DETECTING DEVICE

Irving B. Crandall, of East Orange, N.J., assignor to Western Electric Co.

Patent discloses a soft rubber diaphragm clamped at the periphery to ich is attached a current-varying device. The sensitivity of the apparatus ould be maintained irrespective of the depth of immersion in water.

Claims allowed - 7.

591,612 Patented July 6, 1926

VIBRATION ANALYZER

Hobart C. Dickinson, of Washington, D.C.

Patent discloses a method of photographically recording vibrations from gimbally-mounted mirror. Certain planes of vibration may be directed through mbal supports and thereby eliminated. A method for increasing the intensity of lumination for photographic registration is embodied in the patent.

Claims allowed - 16.

593,972 Patented July 27, 1926

APPARATUS FOR DETERMINING RANGES BY MEANS OF SOUND WAVES

Harvey C. Hayes, of Washington, D.C.

Patent discloses a system made sensitive to echoes and insensitive to rect waves with continuous vibrations by selective spacing of odd one-half

85.

wave lengths between transmitter and receiver. Also by the use of a plurality of transmitters and receivers, operating in phase opposition, the direct wave action is reduced.

Claims allowed - 3.

1,599,538 Patented Sept. 14, 1926

GEOLOGICAL TESTING METHOD

Ludger Mintrop, of Bochurn, Germany

Patent discloses a method of creating seismic disturbance and from it ascertaining the "travel-time" curves. Using these curves as a basis it teach how to detect change of structure from inflection points on these curves. The depth of travel of impulse as a function of the distance, speed, and depth curves and their interpretation are described. The method for detailing by choosing proper location of explosive charge to points selected for recording is explained.

Claims allowed - 16.

1,613,520 Patented Jan. 4, 1927

APPARATUS FOR RECORDING THE DURATION OF VERY BRIEF PHENOMENA

Pierre Auguste Daniel Marti, of Philippeville, Algeria

Patent discloses a method of determing time interval of short duration by using a revolving element in conjunction with a contact point passing over a paper band. Adapted for continuous recording of sonic depths and for ultra-sonorous apparatus of the Langevin type.

Claims allowed - 8.

1,619,017 Patented March 1, 1927

MEANS FOR FINDING DIRECTION

Richard D. Fay, of Nahant, Mass., assignor
to Submarine Signal Co.

Patent discloses a method of determining from what direction sounds ar arriving. Three or more separate sound-receiving systems are employed with a method of connecting to any two for minimum difference in phase. The three ha a displacement in a plane at the points of an equilateral triangle.

Claims allowed - 8.

662,247 Patented March 13, 1928

METHOD AND ARRANGEMENT OF DIRECTIONAL WAVE RECEPTION AND EMISSION

Walter Hahnemann, Henrich Hecht, and Bernhard Nielson,
assignors to Signal Gesellschaft, of Kiel, Germany

Patent discloses a method of arrangement of receivers or senders for rective listening and sending. The arrangement for most effective spacing is scribed. Both left and right ear compensation by the same receiver reduces e minimum binaural base line. The receivers may be placed near the sender, t the sound of the sender does not reach the receiver.

Claims allowed - 5.

706,066 Patented March 19, 1929

METHOD AND APPARATUS FOR LOCATING GEOLOGICAL FORMATIONS

John C. Karcher of Montclair, N.J., assignor to
Geophysical Research Corporation

Patent discloses a system using the radio wave, air wave, and ground impulse simultaneously for determining geological structure. Also a method of locating depth and slope by time of arrival of diffracted ground waves.

Claims allowed - 11.

17,242 Reissued March 19, 1929

METHOD AND APPARATUS FOR DETERMINING THE CONTOUR OF SUBTERRANEAN STRATA

Burton McCollum, of Washington, D.C., assignor to
McCollum Geological Explorations

Original patent No. 1,672,495 dated June 5, 1928

Patent discloses a very comprehensive method of sonic exploration. It teaches how to overcome diffuse reflection by keeping the horizontal distance of the detecting device small from the normal or vertical path of the sound. To overcome differences in intensities of the direct and reflected wave the use of the inverse square relation, the shielding against the direct impulse, and selective operation of two or more recorders are specified. A multiple-receiver system intensifying the reflected wave is disclosed operating in a Wheatstone bridge circuit or coupled to a common mutual induction. A special method of making contact with the ground is described, and a method of mounting the recorder free from the influence of waves other than the desired ones is disclosed.

Claims allowed - 26.

625.

859,123 Patented July 2, 1929

INSTRUMENT FOR RECORDING AND MEASURING VIBRATIONS

Johann Schütte, of Bremerhaven, Germany

Patent discloses a method of utilizing a gyroscope in place of the pendulum for recording oscillations. Various lever arrangements and recording meth are described.

Claims allowed - 2.

1,724,495 Patented Aug. 13, 1929

METHODS AND APPARATUS FOR DETERMINING THE SLOPE OF SUBSURFACE-ROCK BOUNDARIES

Burton McCollum, of Washington, D.C., assignor to McCollum Geological Explorations, Inc.

Patent specifies a method of determining the slope of subterranean boundaries by measuring the time of arrival at a plurality of points substantially equidistant in horizontal plane from a source of sound. The various paths and relative distances are discussed in detail.

Claims allowed - 9.

1,724,720 Patented Aug. 13, 1929

METHOD AND APPARATUS FOR STUDYING SUBSURFACE CONTOURS

Burton McCollum, of Washington, D.C., assignor to McCollum Geological Explorations, Inc.

Patent discloses a method of overcoming uncertainty of slow speed of sound in weathered rocks or unconsolidated stratum relative to the undisintegrated rocks by placing the transmitter of energy or the receiver of energy in the separate stratums at definite configurations.

Claims allowed - 5.

4- ELECTRICAL METHODS

269,439 Patented Dec. 19, 1882

APPARATUS FOR FINDING TORPEDOES, ETC.

Charles Ambrose McEvoy, Adelphi, England

Patent discloses a system of primary and secondary coils; one set is lowered into the water, the other remains on board. The secondary coils are balanced under normal conditions but become unbalanced when near a torpedo.

Claims allowed - 1.

4,885 Patented March 27, 1883.

APPARATUS FOR DETACHING MINERAL ORES

Fred H. Brown, of Boulder, Colo.

Patent discloses an induction coil operated by batteries. The secondary nsists of two exploring wires with suitably insulated handles. The passage of spark at the wire points indicates the presence of an ore conductor.

Claims allowed - 1.

7,087 Patented May 8, 1883

ELECTRIC DIVINING-ROD

Cromwell F. Varley, of Bexley Heath, England

Patent discloses method of locating ores from the effects of the natural lectric currents which traverse the lode. Rotating coils in conjunction with mmutator and galvanometer from the detecting device.

Claims allowed - 1.

3,518 Patented Feb. 12, 1884

MEANS FOR ELECTRICALLY LOCATING AND FOLLOWING VEINS OF METAL IN THE EARTH

Jerome Prince, of Milford, Mass.

Patent discloses a method of indicating the change of resistance of two rminals, fixed at a constant distance from each other, to the flow of electric rrent.

Claims allowed - 2.

8,908 Patented Dec. 9, 1884

MEANS FOR ELECTRICALLY LOCATING MINERAL VEINS

August P. Highthill, of Boston, Mass.

Patent discloses a method for ascertaining currents generated in mineral ins due to chemical changes thereof. Contact is made a few inches into the round, preferably with magnetically polarized probes, and a galvanometer is used indicate the current.

Claims allowed - 4.

25.

367,422 Patented Aug. 2, 1887

ELECTRICAL ORE-DETECTOR

Lemuel Mellett, of Milford, Mass.

Patent discloses a multiple arrangement of electrodes energized by a battery which upon coming in contact with a metallic conductor causes sufficient current to flow to actuate an indicating device. Intended for submerged use.

Claims allowed - 4.

367,541 Patented Aug. 2, 1887

ELECTRICAL ORE-INDICATOR

Lemuel Mellett and Jerome Prince, of Milford, Mass.

Patent discloses a compass needle of multiple points which changes its rate of rotation near an ore body.

Claims allowed - 5.

380,842 Patented April 10, 188[illegible]

APPARATUS FOR EXAMINING ORES

John R. William, of Seattle, and William W. Hickies, of Oakland, Calif.

Patent discloses a method of examining rocks in situ as well as hand specimens to determine whether they contain metallic ores. A battery and a telephone receiver connected in series to two metallic brushes constitute the device. When applied to conducting ore the current actuates the receiver.

Claims allowed - 2.

412,924 Patented Oct. 15, 188[illegible]

ELECTRICAL METAL DETECTOR

Jesse F. Kester, of Terre Haute, Ind.

Patent discloses a mineral detector consisting of a solid elongated tapering blade composed of a pair of metal strips riveted together without making electrical contact. This device is thrust into the ground, and an indicator shows good electrical conductivity in the proximity of ores or metals.

Claims allowed - 1.

45,910 Patented March 20, 1900

PROCESS OF LOCATING METALLIC MINERALS OR BURIED TREASURES

Fred H. Brown, of Chicago, Ill.

Patent discloses a process for resistivity between various portions of the earth. Presence of natural earth currents as disturbing element in direct-current resistance bridge measurement are discussed; alternating current is substituted for the direct current.

Claims allowed - 2.

672,309 Patented April 16, 1901

PROCESS OF LOCATING METALLIC MINERALS

Fred Harvey Brown, of Los Angeles, Calif.

Patent discloses a method of measuring the resistance between stakes by superimposing an electrical impulse upon a previously steady current in a Wheatstone bridge circuit.

Claims allowed - 7.

681,654 Patented Aug. 27, 1901

ELECTRIC PROSPECTING APPARATUS

Augustus F. McClatchey, of Aurora, Ill.

Patent discloses specific methods of making contact with the earth to avoid inaccuracies of measurement. Means for protecting terminales against electrolytic action by suitable chemicals, also special electrodes embracing the above idea.

Claims allowed - 10.

686,632 Patented Nov. 12, 1901

APPARATUS FOR LOCATING METALS, MINERALS, ORES, ETC.

Augustus F. McClatchey, of Aurora, Ill.

Patent discloses in specifications that depth effect in resistivity measurements is a function of the distance between the stakes. It further describes various bridge arrangements with direct and alternating currents for making resistivity observations of the ground.

Claims allowed - 8.

6825.

714,775 Patented Dec. 2, 1902

ELECTRICAL PROCESS OF LOCATING RUNNING WATER IN THE EARTH

Fred Harvey Brown, of Los Angeles, Calif.

Patent discloses a method of receiving the vibrations set up in the channels through which the water passes. These vibrations are transformed to electric pulsations and into sound waves. The volume of sound over various sections are compared to each other.

Claims allowed - 1.

727,077 Patented May 5, 1903

APPARATUS FOR LOCATING METALS, MINERALS, BURIED TREASURES, ETC., WITHOUT DIGGING

Fred Harvey Brown, of Los Angeles, Calif.

Patent discloses a Wheatstone bridge circuit attached to one ground terminal, the other being movable. The current used is from a buzzer supply, and low resistance indicates presence of metal.

Claims allowed - 1.

736,411 Patented Aug. 18, 1903

METHOD OF LOCATING MINERALS

George I. Leonard, of Pasadena, Calif.

Patent discloses a method for measuring the resistance between two electrodes placed in earth. It further specifies that the earth be saturated with a liquid bearing a saturated salt solution of the metal composing the electrode.

Claims allowed - 11.

817,736 Patented April 10, 1906

APPARATUS FOR DETECTING AND LOCALIZING MINERAL DEPOSITS

Leo Daft and Alfred William, of Wimbledon, England

Patent discloses a method for mapping lines of a deposit by applying two electrodes to the soil and proceeding along an equipotential line with a resonant receiver. Lines of electric impulses concentrate over a medium of superior conductivity. An inductorium is used for a source of current. Sharp gradients are sought for to indicate mineral deposits.

Claims allowed - 7.

7,749 Patented April 17, 1906

ELECTRICAL APPARATUS FOR DETERMINING THE LOCATION OF METALLIC ORES

Fred Harvey Brown, of Los Angeles, Calif.

Patent discloses a method of using a variable current in a bridge circuit, one arm of which is the ground and the other an adjustable resistance for determining the resistance between definite intervals on the surface of the ground between two electrodes.

Claims allowed - 4.

40,018 Patented Jan. 1, 1907

APPARATUS FOR SEARCHING OF SUNKEN BODIES

Max von Schoultz, of St. Petersburg, Russia

Patent discloses a system of electromagnetic finders secured to a cable nd dragged along the sea bottom. Differences in magnetic permeability from he surrounding element operate a signal connection to the finder.

Claims allowed - 2.

,045,575 Patented Nov. 26, 1912

METHOD FOR LOCATING SUBTERRANEAN STRATA

Henrich Löwy, of Göttingen, Germany

Patent discloses a method of using reflected electromagnetic waves with separation on the surface for minimum interference expressed as a function of ne-half wave length.

Claims allowed - 5.

,092,065 Patented March 31, 1914

METHOD FOR ASCERTAINING THE NATURE OF SUBTERRANEAN STRATA

Heinrich Löwy, of Göttingen, Germany

Patent discloses a method of applying a calibrated oscillating circuit in mine or hose hole and measuring the variation of capacity and damping in the ircuit.

Claims allowed - 1.

625.

1,163,469 Patented Dec. 7, 191

LOCATION OF ORES IN SUBSOIL

Conrad Schlumberger, of Paris, France

Patent discloses the application of unpolarizable terminal electrodes to the soil for determining series of equipotential curves produced by the or layers on the surface of the ground.

Claims allowed - 3.

1,163,468 Patented Dec. 7, 191

PROCESS FOR DETERMINING THE NATURE OF THE SUBSOIL BY THE AID OF ELECTRICITY

Conrad Schlumberger, of Paris, France

Patent discloses the charting of equipotential curves about an electro placed in the ground. The electrode is supplied with direct or alternating c rent, and nonpolarizable exploring electrodes are used. From the comparison these curves with the theoretical equipotential curves the nature of the subso is determined.

Claims allowed - 6.

1,248,380 Patented Nov. 27, 191

METHOD OF AND APPARATUS FOR DETECTING THE PRESENCE OF ORE DEPOSITS IN THE EARTH

Rupert Nelson, of San Francisco, Calif.

Patent discloses a method of using different metallic ground electrode and measuring the deflection in a quadrant electrometer. The electrode is con nected to the needle and the quadrants are excited by a battery.

Claims allowed - 3.

1,325,554 Patented Dec. 23, 191

MEANS FOR LOCATING ORE BODIES BY AUDIO-FREQUENCY CURRENTS

Wendell E. Carlson and Earl C. Hanson, of Washington, D. C.

Patent discloses an exploring coil forming an arm in a mutual inductio bridge circuit which is balanced by a resistance for a disturbance in the fiel of the coil. Amplifying circuits and audio-frequency are used in the system.

Claims allowed - 3.

1,300 Patented April 29, 1924

PROCESS OF AND DEVICE FOR LOCATING ORE

D. G. Chilson, of Jerome, Ariz., assignor to the University of Arizona

Patent discloses a method of applying an electrical contact to earth and other to a known ore body and testing the intensity of electromagnetic rece- adjacent to these points. High as well as low frequencies are illustrated the specification.

Claims allowed - 5.

2,300 Patented April 29, 1924

MEANS FOR ELECTROMAGNETIC PROOF AND MEASURING OF THE DISTANCE OF ELECTRIC CONDUCTIVE BODIES

Heinrich Löwy, of Vienna, Austria

Patent discloses an antenna carried by a flying machine. The change of natural period of this antenna is measured with a test receiver, and its ation is an indication of the electrical character of the ground.

Claims allowed - 4.

7,640 Patented May 12, 1925

ORE DETECTOR

Hans Torkel Fredrik Lundberg, of Lidingo Villastad, and Harry Johan Hjalmar Mothorst, of Stockholm, Sweden

Patent discloses method of determining equipotential lines on the sur- of the ground by bringing two primary electrodes into contact with the . One of these primary electrodes has a considerable extension in a horizo- al direction in proportion to the distance between the two primary electrodes. itive prcting apparatus using alternating current are shown in the illus- tions.

Claims allowed - 6.

4,940 Patented Dec. 8, 1925

METHOD OF DETECTING THE PRESENCE OF APPROXIMATE LOCATION OF METALLIC MASSES

F. S. Chapman

Patent discloses a method of using the variation of the amplitude of the nd wave from an oscillating antenna and balancing the strengths of the sur- s in the various directions against each other. Greater conductivity indi- s the presence of conductors.

Claims allowed - 5.

1,585,591 Patented May 18, 1926

MEANS FOR ELECTRIC PROOF AND MEASURING OF THE DISTANCE OF ELECTRICALLY CONDUCTIVE BODIES

Heinrich Löwy, of Vienna, Austria

Patent discloses a method for measuring the distance to electrically conductive masses acting as reflecting surfaces by adjusting frequency, modulation in a vacuum tube circuit which alternately puts the transmitter and receiv out of action. If the time of cutting out the transmitter and the arrival of the reflected wave are made to coincide, then a maximum effect is produced in the receiver.

Claims allowed - 4.

1,241,197 Patented Sept. 25, 19

METHOD AND APPARATUS FOR DETERMINING SUBTERRANEOUS CONDUCTORS

Harry R. Conklin, of Joplin, Mo.

Patent discloses an exciting loop placed upon the ground and supplied with high-frequency current from a spark oscillator. The curves of equal magnetic intensities within this loop are determined by two exploring coils acting through a rectified circuit upon a direct current instrument. The contour of these lines is an index to subterranean formations.

Claims allowed - 8.

1,652,227 Patented Dec. 13, 192

METHOD OF INVESTIGATING THE NATURE OF SUBTERRANEAN STRATA

T. Zuschlag

Patent discloses a method of deducing the nature of the strata surroun ing a drill hole by setting up of an antenna in the hole, subjecting it to a variable frequency, and thereby ascertaining the resistance characteristics to each frequency.

Claims allowed - 1.

1,660,774 Patented Feb. 28, 192

METHOD FOR ELECTRICAL SEARCHING OF ORE

Mauritz Vos, of Stockholm, and Karl Lundberg, of Rasunda, Sweden, assignors to Svenska Radioaktiebolaget of Stockholm, Sweden

Patent discloses a method for detecting the present of ore deposits by direct-connecting an alternator to the earth and measuring the magnetic

ld distribution in the excited area. Intensities greater than the normal ld intensities indicate the presence of ore bodies.

Claims allowed - 4.

665,662 Patented April 10, 1928

ELECTROMAGNETIC DETECTING DEVICE

Cecil E. Godkin, of Hayward, Calif.

Patent discloses a means of locating oil with the aid of an electric nerator and galvanometer.

Claims allowed - 2.

672,328 Patented June 5, 1928

METHOD OF ELECTROMAGNETIC UNDERGROUND PROSPECTING

William A. Loth, of Paris, France

Patent discloses the application of an alternating electric current to e earth with electrodes and the measuring of the resultant magnetic field on e surface with exploring coils.

Claims allowed - 12.

676,847 Patented July 10, 1928

METHOD AND APPARATUS FOR EXPLORING SUBTERRANEAN STRATA

Theodore Zuschlag, New York City, assignor to Taumac Corporation

Patent discloses a method of determining the amplitude and phase of the ternating magnetic field in three perpendicular directions and computing refrom the resultant. Bridge circuits with vacuum tube amplifiers are scribed in the specifications.

Claims allowed - 3.

676,779 Patented Jul 10, 1928

DEVICE FOR UNDERGROUND PROSPECTING

Shirl Herr, of Crawfordsville, Ind.

Patent discloses a method of locating electrical conductors with the of two coils, one an exciting coil and the other a receiving coil. Alternating current is used in the exciting coil and the respective axis can be

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sighted for mutually perpendicular adjustment. Normally this indicates a number of receptions of signal in the receiving coil. The variation of this minimum indication is used as an index to the disturbing electrical conductor.

Claims allowed - 4.

1,678,489 Patented July 24, 192

METHOD AND DEVICE FOR DETECTING AND LOCATING ORES IN AN ELECTROMAGNETIC WAY

Karl Sundberg, of Rasunda, Sweden, assignor to Aktiebolaget Elektrisk Malmletning

Patent discloses a method of subjecting the ground to the reaction of an alternating magnetic field and measuring the relative field intensities in the excited region. This is done with two coils and, if necessary, also by the aid of suitable extra series or shunt resistances or inductances. The method of procedure is described in detal. A portion of a known alternating magnetic field is balanced against an unknown one.

Claims allowed - 15.

1,679,339 Patented July 31, 192

Hidden-Metal Detector

Shirl Herr, of Crawfordsville, Ind.

Patent discloses a method of locating hidden metal by the imbalancing of an alternating magnetic field in an exploring coil. The source of the primary field is a coil fixed in an adjustable position relative to the exploring coil near its center and having its axis at right angles to the exploring coil.

Claims allowed - 4.

1,692,530 Patented Nov. 20, 1928

METHOD AND APPARATUS FOR LOCATING ORE BODIES

Theodore Zuschlag, of New York City, assignor to the Taumac Corporation

Patent discloses a method of reducing the magnetic field from the wires applied to stakes using alternating current by using another system of stakes in another adjacent circuit parallel to the former in which a current of the same amplitude but not of the same circuit flows in phase opposition.

Claims allowed - 7.

,692,849 Patented Nov. 27, 1928

METHOD OF DETERMINING THE NATURE OF SUBSOIL

Max Mason, of Chicago, Ill.

Patent discloses a method of exploring the subsoil by applying elec-rical energy to the ground at two terminals with two other terminals as indi-ating terminals. The relation of the two current terminals and a potential rminal remains fixed; the other detecting terminal is moved for minimum cur-nt. All four terminals preferably are colinear, and the system is moved along definite line for observations.

Claims allowed - 3.

708,386 Patented April 9, 1929

ELECTRICAL PROSPECTING DEVICE

Norbert Gella, of Cassel-Welhelmshöhe, Germany, assignor to Peepmeyer & Co.

Patent discloses an exploring coil for measuring intensity and direction alternating magnetic fields by a universally mounted coil with a protection ainst capacity influences by a tubular sheath.

Claims allowed - 4.

718,352 Patented June 25, 1929

METHOD OF LOCATING UNDERGROUND CONDUCTING BODIES

E. H. Guilford, of Darwin, Calif.

Patent discloses a method of inducing high-frequency currents in a con-ctor and detecting the magnetic fields from the currents in the conductor and s general axis. Selection of optimum frequency and maximum distorting effects a plurality of points and the determination of the apparent distortion of the imary field are described. Also a method of determining the depth of the con-ctor from the various positions of the receiving coil is specified.

Claims allowed - 11.

719,786 Patented July 2, 1929

METHOD FOR THE LOCATION OF OIL-BEARING FORMATIONS

Conrad Schlumberger, of Paris, France

Patent discloses a method of measuring the conductivity of the ground tween a pair of surface points spaced apart on a radius through one terminal --

the other is shown at a great distance from the first. Oil-bearing formations are located by comparing areas of greatest electrical conductivity coincident w greatest salinity.

Claims allowed - 1.

1,724,794 Patented Aug. 13, 192

METHOD OF DETECTING ORE DEPOSITS

Walter W. Davis, of Great Neck, N.Y.

Patent discloses a method using Hertzian waves in subterranean transmission to locate ore by operating from one drift to another. The deflection of these waves from the normal straight path indicates unhomogeneity.

Claims allowed - 4.

C.6209.
ovember, 1929.

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 7

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

THE COMPUTATIONS OF GRAVITATIONAL EFFECTS DUE TO IRREGULAR MASS DISTRIBUTIONS

By E. Lancaster Jones

Monthly Notices of the Royal Astronomical Society, Geophysical Supplement, vol. 2, No. 3, May, 1929, pp. 121-140.

The X component of the gradient due to a small prism parallel to the X axes is a simple function of its depth, cross section, and $(\frac{1}{r_1^3} - \frac{1}{r_2^3})$ where r is the diagonal radial distance of the end of the prism from the origin. The value of $\frac{1}{r^3}$ can be determined graphically by a very simple device. By the use of contours and horizontal parallels on the map, any irregular body can be split up into a series of such prisms of known cross section and depth. The values of $\frac{1}{r_1^3}$ and $\frac{1}{r_2^3}$ are read off graphically. The summation of the [summation of $(\frac{1}{r_1^3} - \frac{1}{r_2^3})$ for any depth times the proper constant of factor] gives the total $\frac{\triangle^2 U}{\triangle x \triangle z}$ or $\frac{\triangle^2 U}{\triangle y \, dy}$, $\frac{\triangle^2 U}{\triangle x \triangle z}$, $(\frac{\triangle^2 U}{\triangle y^2} - \frac{\triangle^2 U}{\triangle x^2})$. The method is developed for horizontal and vertical prisms, for cylindrical coordinates, and for the computation of $\frac{\triangle^2 U}{\triangle z^2}$, $\frac{\triangle U}{\triangle x}$, $\frac{\triangle U}{\triangle y}$, and $\frac{\triangle U}{\triangle z}$.

This is a quick simple method of calculating the gravitation effects where assumptions of symmetry may not be used. Most American geologist-geophysicists will not be able to follow the argument of the paper without the assistance of a mathematician. -- Donald C. Barton.

THE TORSION BALANCE IN THE DETERMINATION OF THE FIGURE OF THE EARTH

By Donald C. Barton

American Journal Science, vol. 18, 1929, pp. 149-154.

On account of the warping of the level surfaces and of the lines of the vertical, the Eotvos torsion balance can measure the horizontal gravity gradient and a quantity proportional to the difference of the radii of curvature of the level surfaces. The variation of gravity can be calculated from the gradient, and the form of the level surface and the variation of the deflection of the vertical can be calculated from the differential curvature for the area between two points, if absolute geodetic observations are availab

those points. Determinations of Δg at Damon Mound by the torsion balance and pendulum methods do not check within 0.050 dyne, about 1½ times the probable error of observation. In Oklahoma the values of Δg for four stations as determined give very much closer approximation to the theoretical values than the pendulum observations reduced by the isostatic Bouguer or free-air methods. The gradient due to the flattening of the earth calculated from 2,100 torsion balance observations was 7.4E against the theoretic value of 8.14E. Various positive anomalies of 0.030, 0.157, and 0.500 dynes have been mapped in Texas, Oklahoma, and New Mexico, and the most important contribution of the torsion balance to geodesy is the knowledge of the detailed variation of gravity over large areas and of the abundant presence of local anomalies of very large magnitude. -- Author's abstract.

TABLES OF TERRANE EFFECTS

By Donald C. Barton

Bulletin of the American Association of Petroleum Geologists, vol. 13, No. 7, July, 1929, pp. 766-770.

Tables of terrane effects have been devised for use in routine commercial surveys with the torsion balance in areas of moderate relief. For that purpose they are a slight refinement and improvement over the graphical methods of calculating terrane effects, described by the writer, Haalck, and Heiland. The terrane is divided into

(a) Octants and zones of 5 $\sqrt[3]{10^n}$ radius, and into

(b) $22\frac{1}{2}^\circ$ sectors and zones of 5 $\sqrt[6]{10^n}$ radius.

Each zone is divided vertically into prisms, and this series of prisms is projected by the law of similar bodies in projection of one another into the other zones of the same octant or sector. The gradient and differential curvature produced by each of the prisms is calculated by the formula for a vertical concentric curvilinear prism in cylindrical coordinates. The effects are tabulated for elevations of 0 to 2 in the 5 to 11 zone (5 to 7.3), and the corresponding elevations in the 11 to 33, and 23 to 50 zones (7.3 to 10.8, 10.8 to 15.9, 15.9 to 23.2, 23.2 to 34.1, and 34.1 to 50 zones). A similar table is given by octants for the zone 0 to 2.5. A somewhat similar table is given for the effects produced by an infinite straight ditch or embankment. These tables, or preferably tables valid to infinite depth, can be used to calculate the effects of anomalous masses in the subsurface. -- Author's abstract.

ANONYMOUS EDITORIAL

The Mining Magazine, vol. 40, No. 6, June, 1929, p. 336.

A note states that "the gravity gradiometer designed by Capt. Shaw and Mr. E. Lancaster Jones ** has been used successfully and employed in surveys of the brown coal fields of Victoria, Australia." -- Donald C. Barton.

UEBER DIE FESTSTELLUNG VON VERWERFUNGEN MIT DER DREHWAAGE

(DETERMINATION OF FAULTS WITH THE TORSION BALANCE)

By H. Seblatnigg

"Braunkohle," vol. 23, 1929, pp. 1-5.

The torsion balance was used to determine the course and position of a shallow fault in the Borken Tertiary brown coal field in Germany. From widely spaced core holes, Buntsandstein was known to have been faulted up to within 15 meters of the surface. Four profiles were run with the torsion balance to determine the exact position of the fault. The torsion balance determination of the fault was checked by the results of subsequent drilling. -- Donald C. Barton.

DIE ENTWICKLUNG DER EÖTVÖSCHEN ORIGINALDREHWAGEN

(DEVELOPMENT OF EÖTVÖS' TORSION BALANCE)

By D. Pekar

Die Naturwissenschaften, vol. 51, Dec., 1928, pp. 1079-1088.

A detailed description of the development of the Eötvös torsion, the first model of which appeared under the name "Horizontal gravity variometer" as early as 1890, is given.

A series of photographic pictures of various models completes the article.

Pekar indicates the importance of the torsion balance in geophysical, seismical, geodetical, and geological investigations, as well as its practical application for ore prospecting.

Photographic registration of the data, according to Pekar, is not used in Hungary for the following reasons:

1. The instrument is affected by the heat of the lamp;
2. The keeping in order of lights and arrangements for automatic registration is often difficult;
3. Errors may arise owing to disarrangements in the registration device; they can be established only after the development of the film.
4. The development of the films in the field is difficult, especially during bad weather.
5. Numerical data obtained by visual observation may be utilized immediately, while the photographic data must be calculat

In the opinion of the author, all these disadvantages can not be counterbalanced by the sole advantage of photographic registration--that of convenience. -- W. Ayvazoglou.

A GRAVITY VARIOMETER MADE OF VITREOUS SILICA

By Chuji Tsuboi

Proceedings of the Imperial Academy, Tokyo, vol. 4, No. 6, 1928, pp. 300-302.

Tsuboi describes the result of an attempt to construct a gravity variometer from vitreous silica, as by using this material the weight of the instruments may be reduced considerably. The following favorable physical properties of vitreous silica are mentioned especially: The material is almost entirely free from elastic hysteresis, and its thermal expansion coefficient is extremely small; the material can be drawn into an extremely fine fibre with a radius of 5 microns. As the sensitivity of the variometer is inversely proportional to the fourth power of the radius of the suspension fibre, the author considers this circumstance alone sufficient for preferring the use of this material for the present purpose.

A detailed description of the instrument is given; its weight with necessary accessories scarcely surpasses 8 kilograms. Preliminary measurements of the second space derivatives of the gravitational potential with the new balance gave satisfactory results. Two readings corresponding to the two settings of the balance in the same azimuth but with different previous settings coincide with each other satisfactorily. According to the author this is partly due to the fact that the suspension fibre is directly fused on the rod, avoiding any kind of binding material. -- W. Ayvazoglou.

2. MAGNETIC METHODS

A NEW MAGNETOMETER

Anonymous

The Mining Magazine, vol. 41, No. 1, July, 1929, pp. 37-39.

The new magnetometer manufactured by the Cambridge Instrument Co. of England is essentially a sine galvanometer adapted to the measurement of the relative intensity of the horizontal component of the earth's magnetic field. A known current accurately measured and flowing through the coil is used to cause a deflection of a floating magnet. The magnetometer is designed to measure field intensities ranging from 0.16 to 0.19 c. g. s. with an accuracy of one part in 20,000. A complete determination can be made in 10 minutes. -- Donald C. Barton.

MAGNETIC OBSERVATIONS ON THE SWYNNERTON DYKE

By A. F. Hallimond

The Mining Magazine (London), vol. 41, No. 1, July, 1929, pp. 16-22.

A series of 13 profiles was run with a Schmidt-Lloyd vertical variometer across the Swynnerton Dyke in North Staffordshire, England, a nearly vertical monchcline basanite dyke rather rich in iron ores and intruded into Keuper marls. The northern profiles were run across outcrops of the dyke. The profiles G to P mapped the hidden southern extension of the dyke. The anomaly ranged from nearly 1,200 gamma on the northernmost profiles to 15 to 50 gamma on the southernmost two profiles. Where the dyke is very wide (200 feet) the marginal portions show peaks of maxima; specimens obtainable along profile B show the central portion of the dyke to be much poorer in iron ores than the marginal portions. The profiles show that the width of the dyke decreases to about 15 feet on profile E. Yet further south the dyke is represented by three small dykes. On one profile across an exposed portion of a 4-foot dyke, observations were made with the magnetometer at elevations both of 2 feet 8 inches, and 4 feet above the ground. Although no such statement is made by the author, the results indicate that the center of effect is essentially at the surface and therefore suggest that the dyke is magnetized vertically with the upper pole practically at the surface, for the ratios of the intensities measured at the 2-2/3-foot and 4-foot elevations are 1.4:1 over the dyke and 1:00 at a distance of 15 feet away from the dyke. -- Donald C. Barton.

THE HISTORY OF MAGNETIC PROSPECTING FOR ORE

By Hans Lundberg

The Mining Magazine (London), vol. 40, No. 2, August, 1929, pp. 73-78.

Magnetic prospecting for magnetic ores has been in successful use in Sweden since early in the 17th century and in New York and New Jersey since the 18th century. The miner's (dip) compass dates from the 18th century. A great advance came with Thalen's contributions to the theory of magnetic prospecting and with Thalen and Tiberg's invention of the magnetometer and inclinator in the early 80's of the 19th century.

Experimental work with the electric methods dates from Fox's work in England in 1830. Contributions were made by Reich of Germany in 1844, Barus in Nevada in 1880, and by Williams of England and Daft of America in the late 1890's. The first ore body was discovered by Muenster of Norway in 1907. Much experimental work was done in Sweden in 1907, and beginning with 1912. Schlumberger perfected his natural earth current method in 1912. The equipotential method was introduced by Bergstrom in 1913. The liner electrode method was perfected by Lundberg and Nathurst in 1918. The first experimental work with the electromagnetic methods was done by Lowy and Leimbach in Germany in 1910-1911, and by Conklin in America in 1917. The first ore body was discovered by electro-magnetic methods by Sundberg in Sweden in 1921. The first discovery of ore in America by electrical prospecting was made by Swedish engineers in 1924. — Donald C. Barton.

MAGNETOMETER SURVEY OF LOUISIANA

By L. Sparagen

The Oil and Gas Journal, vol. 37, No. 46, April 1, 1939, pp. 108 and 110; vol. 37, No. 48, April 15, 1939, pp. 85 and 96.

The survey is based on the U. S. Coast and Geodetic Survey observations, which with few exceptions, were made only at the parish (county) seats. The vertical intensity is contoured with isogams of 100 gammas interval with:

(a) The observed vertical intensity, and

(b) The latter corrected for the regional variation.

A vague reflection of some of the major structural features can be seen in some of the magnetic anomalies; the Sabine and Monroe uplifts show positive anomalies and the intervening geosyncline shows a negative anomaly; an east-west positive anomaly corresponds with the west half of the Sulphur-Lockport-Jennings salt-dome line. But on the other hand, the Many area shows as big a positive anomaly as the Sabine uplift and the area southeast of Lafayette and Baton Rouge, and the indications from the magnetic anomalies are contrary to the geology. The stations are so widely scattered that such studies are of very slight practical value to the experienced geophysicist and are dangerous in the hands of a layman. -- Donald C. Barton.

MISSISSIPPI MAGNETOMETER READINGS

By L. Sparagen

The Oil and Gas Journal, vol. 37, No. 52, May 16, 1939, pp. 39 and 198; vol. 38, No. 3, June 8, 1939, p. 48; vol. 38, No. 6, June 27, 1939, pp. 101 and 178-180.

The study is based on the U. S. Coast and Geodetic Survey observations, most of which were made only at the county seats. Isogam maps are given:

(a) For the observed values of the vertical intensity, and

(b) For the anomalous value of the vertical intensity obtained by applying a regional correction.

Profiles of the vertical intensity are drawn on several lines across the State. Although certain vague reflections of the major features of the subsurface structure can be seen in the magnetic results, the stations are so few and so far apart that studies of this type are of little service to the expert geophysicist and are dangerous in the hands of the layman. -- Donald C. Barton.

BEITRAGE ZUR THEORIE DES MAGNETOMETERS VON TIBERG-THALEN

(CONTRIBUTIONS TO THE THEORY OF TIBERG-THALEN'S MAGNETOMETER)

By Viktor Theimer

Zeitschrift fuer Instrumentenkunde, vol. 7 and 8, July and August, 1929, pp. 342-356 and 386-395.

After a brief introduction dealing with the purpose of the instrument, Theimer describes its construction. The constituent parts of the Tiberg-Thalen-Dahlblom magnetometer are a compass with a strong magnetic needle and two arms provided with a millimeter graduation; the arms form a constant angle of 30°. The original Tiberg arm is removed to the prolongated zero-direction of the hour-circle and has a millimeter graduation of from 10 centimeters to 22 centimeters. The Dahlblom arm, which forms with the Tiberg arm a constant angle of 30°, has a millimeter graduation of from 10 centimeter to 44 centimeter; thus, it is twice as long as the Tiberg arm.

Both arms are provided with adjustable sliding carriages to which a short but very strong bar magnet can be fixed.

The bar magnet, fixed to one of the two sliding-carriages, forces the magnetic needle of the compass to decline at a certain angle from its original position of rest; from this angle, as well as from the adjusted distance of the center of the bar magnet from the point of rotation of the magnetic needle the horizontal intensity of the earth magnetic field for a certain point of observation can be determined.

In the present article Theimer describes the methods for observation and calculations in connection with this arrangement of the magnetometer. Detailed calculations, accompanied by pictures, for the measurements of horizontal and vertical intensities are given.

The last part of the article deals with the use of the Tiberg-Thalen magnetometer for the discovery of ore deposits; some special cases are examined. -- W. Ayvazoglou.

DIE MESSUNG DER HORIZONTAL UND DER VERTICALINTENSITÄT DES ERDMAGNETISCHEN FELDES MIT DEM MAGNETRON.

(MEASUREMENT OF THE HORIZONTAL AND VERTICAL INTENSITY OF THE EARTH'S MAGNETIC FIELD WITH A MAGNETRON)

By M. Rössiger

Zeitschrift fuer Instrumentenkunde, vol. 3, March, 1929, pp. 105-113
Zeitschrift fuer Geophysik, 1928, pp. 371-372.

The possibility of measuring the earth's magnetic field by means of a "magnetron" was noticed in 1923 (A. Hull). In the two articles mentioned

ove the author describes the arrangement of the magnetron, as well as its e. The magnetron is an electronic tube provided with two electrodes one of ich is a straight filament serving as a source of electrons, and the other a lindrical plate along the axis of the filament.

The filament is the cathode and the plate is the anode of the tube. e electrons which leave the filament are diverted by the magnetic field rected parallel to the filament into circular courses. The anode current represented as a function of the magnetic strength of field. The current tween the filament and the plate can be stopped by applying a magnetic field rallel to the filament. If the applied magnetic field is below a certain itical value it has little influence upon the current; at the critical value e current decreases very rapidly, and above it the current is zero. In the ansition region the magnetron is a sensitive indicator of changes in the magtic field. A change of field of 10 γ corresponds to the change of the anode rrent of 2 by 10^{7} ampere. In order to utilize this sensitiveness the great fluence of the heating current must be reduced. This effect is obtained by nducting the heating current through a coil coaxial with the filament. The mber of turns of the coil is calculated so that the increase of the anode rrent caused by the increase of the heating current is counterbalanced by e increased magnetic field of the coil. The magnetron and the coil form e indicator. The indicator is secured rigidly inside of a pair of Helmholtz ils, and the whole system can be turned about a horizontal and vertical axis.

For taking measurements of the horizontal intensity the filament is ought into a horizontal position, the apparatus rotated about a vertical is, and the plate-current read. Maximum and minimum intensities occur when e filament lies in the magnetic meridian.

Having fixed the filament in the meridian plane, the plate-current read. The apparatus is swung through 180° about a horizontal axis, and the late-current is brought back to its old value by sending a current through e Helmholtz coils. The compensating field of the Helmholtz coils is then ice the horizontal intensity.

The vertical component is measured similarly.

In order to eliminate the error in the adjustment of the tube the easurements are repeated after the apparatus has been turned 180° about the rtical axis.

The accuracy of the measurements is about .40 γ. The weight of paratus is 40 kilograms, including the storage batteries. -- W. Ayvazoglou.

DISTRIBUTION - COEFFICIENTS FOR VERTICAL-INTENSITY MAGNETIC VARIOMETERS

By H. E. McComb

Terrestrial Magnetism, vol. 34, No. 1, March, 1929, pp. 59-61.

Scale values were determined in the usual manner by means of a all deflector at short distances and with the deflection bar set for various

azimuths. These were referred to the values obtained with a large deflector at a great distance as standard, and from the resulting differences the distribution factors were computed. -- Author's abstract.

VARIOMETER SCALE-VALUE DETERMINATIONS WITH A LARGE DEFLECTOR

By A. K. Ludy

Terrestrial Magnetism, vol. 34, No. 1, March, 1929, pp. 63-66.

Vertical and horizontal-intensity variometer scale-values were determined by the usual method of using a small deflector at short distances and a large deflector at large distances. The results indicate that the latter method has several advantages and is to be preferred. -- Author's abstract.

METHOD IN OSCILLATIONS

By W. N. McFarland

Terrestrial Magnetism, vol. 34, No. 1, March, 1929, pp. 67-72.

The aim of this paper is to develop the best arrangement of the oscillation-observations of the measurement of horizontal intensity by considering the relative precisions obtained from varying the length of the series and the method of computation.

The variation of precision in the final mean value with arrangement of the observational and computational work is shown by a figure, and the formula is stated for the propagation of this observational error into the computed value of the horizontal intensity. -- Author's abstract.

ON CERTAIN SOURCES OF ERROR IN DETERMINATIONS OF MAGNETIC DECLINATION

By Gustaf S. Ljungdahl

Terrestrial Magnetism, vol. 34, No. 1, March, 1929, pp. 73-76.

In a magnetometer fitted with an optical collimating-system attached to the magnet a possibility exists of corrections, which are due to defects in the lens. A perfect magnetometer ought not have any corrections at all in determining declination. A criterion of noncorrection is given. Errors of observation may be diminished by pointing on more than one reticle in the field of view of the telescope. -- Author's abstract.

A MAGNETIC RESURVEY OF PART OF THE NORTHAMPTONSHIRE IRON FIELD

By W. H. Fordham

The Mining Magazine, London, vol. 39, No. 1, July, 1928, pp. 18-25.

The article contains a description of a new magnetometer for the

asurement of the vertical component of the magnetic force, made by L. Oertng, Ltd., of London.

Results of a resurvey over a bed of the Northamptonshire iron field rried out with this instrument are given.

The new instrument is a sensitive design of the Thompson-Thalen gnetometer, the only essential difference being that a pair of vertical corol magnets, with poles reversed, has been substituted for the single magnet.

By means of a balance weight the instrument is adjusted to read ro in a normal field. When observations are made in a disturbed field, the strument reads high if the force is greater than the normal and low if less, d is brought back to read zero by raising or lowering one or the other of e vertical magnets.

From the distance through which the magnet is moved the change in rce is calculated.

The theory of the instrument is described, and details of it are ven, accompanied by a view and diagram.

The resurvey of the Northamptonshire district was made in 1928 at points marked on the plan. The new instrument described above was used r the observations.

A copy of the field book is given in a table; the results, which general must be considered to be reliable, are plotted in a figure. -- W. vazoglou.

MAGNETIC SURVEY IN THE REGION OF BABA-ZANAN

. By A. Zaborovsky (In Russian)

Azerbeidjan Petroleum Industry, Baku, vol. 4, April, 1928, pp. 49-58.

A necessary condition for obtaining information by means of magnetic rvey consists of the presence in the ground of materials possessing precise gnetic properties. The oil-bearing regions of the Apsheron peninsula aucasus), as well as the regions situated close to it, contain magnetite th all its properties, such as high magnetic susceptibility and capability being magnetized under the influence of the inductive effect of the earth's gnetic field.

Although the amount of magnetite usually does not exceed 1 per cent, is sufficient for calculating the approximate value of the magnetic field eated by magnetite included in rocks 10 meters thick and at a depth of 100 ters; the maximum value of the magnetic tension will be of the order of 5 γ. e measurement of such a field by using modern instruments is possible. sed on these calculations a magnetic survey in the region of Baba-Zanan was arted.

Magnetic observations were made on a series of stations situated along two lines parallel one to another. For the establishment of horizontal and vertical intensities local variometers were used.

The accuracy of measurement was estimated at $\pm 5\ \gamma$ for the horizont intensity and $\pm 9\ \gamma$ for the vertical component of the magnetic field.

A map of the region and diagrams of magnetic curves are given. The results obtained were examined and have proved to be satisfactory.

The author concludes that the question of using magnetic methods as an aid in geological investigation of regions similar to that of Baba-Zanan must be solved in favor of these methods under the condition, of course, that the most sensitive instruments available at the present time are used. -- W. Ayvazoglou.

3. SEISMIC METHODS

FURTHER NOTE ON SEISMIC OBSERVATIONS WITH LONG PERIOD HORIZONTAL PENDULUMS

By Akitune Imamura

Proceedings of the Imperial Academy, Tokyo, vol. 4, No. 7, 1928, pp. 367-370.

The present paper is the result of observations made by Imamura, with special reference to large earthquakes of near origin, with a seismograph having a free vibration period of a length of 3.5 minutes.

The writer was especially interested in the observations of slow waves. Figures are given showing the reproduction of seismograms of the earthquake originating on May 27, 1928, and obtained with the 3-minute pendulums. The cause giving use to slow seismic motions the writer is inclined to attribute to the large displacements of crustal blocks; that of the quick seismic motions, registrable by the ordinary seismograph, may be assigned to vibrations caused at the place of contact of two adjacent blocks in the courses of their sliding, pressing, etc., against one another. -- W. Ayvazoglou.

NEW SEISMIC METHOD SAID TO PARALLEL CURRENT PRACTICE

By Donald C. Barton

Engineering and Mining Journal, vol. 128, No. 5, Aug. 3, 1929, p. 180.

This is a brief note calling attention to the fact that the "new" seismograph method described by R. Ambronn in "Modern Instruments for Seismic Prospecting," Engineering and Mining Journal, vol. 128, No. 3, July 30, 1929,

. 93-99, is not new but parallels current American practice, and that Dr. bronn's paper totally ignores American practice of the past four years. -- nald C. Barton.

MODERN INSTRUMENTS FOR SEISMIC PROSPECTING

By R. Ambronn

Engineering and Mining Journal, vol. 128, No. 3, July 20, 1929, pp. 93-99, (Translated into English by E. U. Von Buelow.)

Dr. Ambronn announces a "new" type of seismograph which registers ectrically the acceleration of the earth movement rather than the total vement registered by the mechanical seismographs. On account of the elec- ical registration, very high amplification is possible. Several receivers d the shot time-line are connected to a multiple unit recording galvanometer d record on a single film. Time can be measured to 0.001 second. A consid- able discussion is given of the advantages of an electric seismograph regis- ring acceleration compared to the disadvantages of the mechanical seismograph gistering total movement.

The assertions are made by Ambronn that seismographs used to date e mechanical seismographs; that his new seismograph has much higher sensi- vity than the seismographs in use; that the ordinary ground unrest is oided; and that explosive charges of the order of only 20 to 100 grams of namite per kilometer are sufficient to give clear records.

This paper reflects the same stage of development through which the erican seismic method passed four years ago. The general type of instrument d method which are proposed by Ambronn have been standard in America for ur years. More electric seismographs, registering acceleration, are in use America than any other type. That type of seismograph and the method pro- sed by the writer already have to their credit 12 salt domes definitely oved by drilling, and many more which have not yet been drilled. Several pes of American electric seismographs have very much greater sensitivity an the "new" instrument, and possible amplification that they can use. undant ground unrest of sufficiently short period seriously to obscure the pact of the explosion waves is present and precludes the use of high sensi- ivity and amplification, although of course, as the author correctly states, e unrest with a period longer than a few tenths of a second does not serious- affect the acceleration type of instruments. It has been found in this coun- y that the inexperienced introducers of a new type invariably stress the persensitivity of his instrument and the smallness of the charge of dynamite quired. As the controlling factor is the ground unrest and not the super- ensitivity of the instrument, there is no reason to believe that the seismo- aph proposed by the author has any greater effective sensitivity or can use y lower charges of dynamite than the present American electric seismographs. cording to the standards of American practice, many of the seismograms lustrating the paper show an attempt to use too much amplification and not ough dynamite and would be thrown out as having too much ground or instru- ntal unrest. -- Donald C. Barton.

A DEVICE FOR PREVENTING THE INSTABILITY OF HORIZONTAL SEISMOMETERS

By Kyoji Suyehiro

Proceedings of the Imperial Academy, Tokyo, vol. 4, No. 10, Dec., 1928, pp. 597-599.

In one of his previous notes Suyehiro showed that a horizontal seismometer, using the Paschwitz pendulum, became unstable when it was subjected to a horizontal accelerating motion parallel to the central plane of the apparatus, and that consequently the record obtained by it was not trustworthy.

To avoid this the author constructed an apparatus, the description of which is given in the article. The apparatus consists of a pair of Paschwitz pendulums placed parallel to each other in opposite directions, with a proper distance between their central planes. In order to unite the pair and to make a closed kinematic chain out of them, the tops of the frames holding the weights are bridged by a coupler link over the center of gravity of each weight.

When such a duplex pendulum is subjected to an accelerating motion in the longitudinal direction, perpendicular to that motion which the apparatus is intended to register, the instability, if occurring, of one of the pair caused by this motion is compensated by the increased stability of the other.

The author compared the behavior of the single and duplex types, placing them upon a special experimental oscillating platform. The results of the tests show that whereas the single type, having the natural period of 4.0 seconds is set into a violent oscillation under the oscillation of the platform at a period of 1.0 seconds, the duplex type, having the same natural period, is only slightly affected by the same oscillation of the platform. Diagrams showing the results of the experiment are given. -- W. Ayvazoglou.

4. ELECTRICAL METHODS

NEUERES ÜBER GEOELEKTRISCHE UNTERSUCHUNGSMETHODEN MIT WECHSELSTROM

(ON THE GEOELECTRIC METHODS OF PROSPECTING BY MEANS OF ALTERNATING CURRENT)

By Wilhelm Geyer

Helios, No. 22, June, 1929, pp. 221-226.

After the description of geoelectrical methods of prospecting, especially of the direct current method introduced by Schlumberger, Geyer compares this method with that in which alternating current is used. He mentions the advantages of the latter method and explains the proceedings of measurements.

A list of literature on electrical methods of prospecting is added. W. Ayvazoglou.

ELECTRICAL PROSPECTING OF ORE BODIES BASED UPON MEASUREMENT OF ALTERNATING MAGNETIC FIELDS (In Russian)

By V. Frederiks

Comité Géologique, Materiaux pour la géologie générale et appliqué. No. 132, Leningrad, 1929, 137 pages.

The author gives the results of electrical prospecting, based upon asurement of alternating magnetic fields, performed in the U.S.S.R. during e last three years.

The book is divided into three parts:

Part I.

Chapter 1. Magnetic field produced by an alternating current directed to the ground or flowing through a cable.

Chapter 2. Methods of measuring the magnetic field.

Chapter 3. Coils with two axes of rotation

Chapter 4. Three-axial coils.

Chapter 5. Phase measurements and the method of two coils.

Chapter 6. Measuring of electromotive forces by means of lamp-voltmeters.

Part II: The normal magnetic field.

Chapter 7. The normal magnetic field.

Chapter 8. Observations made on the first normal field in Ushaki, near Leningrad; comparison of it with the theoretical normal field with cables arranged according to Sundberg.

Chapter 9. Observations made on the second normal field in the Ural with the same arrangement of the cables.

Chapter 10. Observations made on the third normal field in the Ural with the same arrangement of the cables.

Chapter 11. Observations made on a normal field with the arrangement of the cables according to Elbof.

Chapter 12. Observations made on a normal field by using closed loops.

Part III. Observations made on ore-bearing areas.

Chapter 13. Observations made on the first ore-bearing area with the arrangement of the cables according to Sundberg.

Chapter 14. Observations made on the second ore-bearing area with the same arrangement of the cables.

Chapter 15. Observations made on the third ore-bearing area with the same arrangement of the cables.

Chapter 16. Observations made on the third ore-bearing area with the arrangement of the cables according to Bursian.

Chapter 17. Observations made on the same area with the arrangement of the cables according to Elbof.

Chapter 18. Observations made on the San-Donato (Ural) ore-bearing area by using closed loops without grounding.

Chapter 19. Conclusions.

The first part serves as an introduction in which certain properties of an alternating magnetic field produced by an electric alternating current, either directed to the ground or flowing through a cable, are described. Methods of measuring the magnetic field are pointed out and the designations of the different peculiar values explained. Coils with two and three axes of rotation, as well as the methods of handling them, are described. Lamp-voltmeters applied for measurements of electromotive forces were of swedish construction.

The second part deals with the so-called "normal" magnetic field. In some cases the data were calculated theoretically and the results of calculations were compared with the data obtained by observations.

The third part contains a description of observations made on several ore-bearing areas. The results obtained are shown in diagrams. The graphical method of interpretation was used in most cases.

The results of the observations are summarized by the author as follows:

1. The method of prospecting based on the measurement of the intensity of magnetic fields by means of cables disposed according to Sundberg, Bursian, or in the form of closed loops, made it possible to determine in all the cases examined the places and the depth at which the ore body is to be sought. The determination of the declination and of the dip of ore bodies occurring under conditions similar to those explored by means of the methods described above is, so far, difficult.

2. A similar method with Elbof's short cable provides the sibility of determination of the presence of the ore, but does not supply exact indication regarding the extent and the location of the ore body, any indication concerning its depth.

It shows with great exactitude the direction of the strike of the ntry rock, and thus may adequately be applied for that determination. -- W. vazoglou.

5. RADIOACTIVE METHODS

MESSUNGEN UEBER DAS KURZWELLIGE ENDE DER DURCHDRINGENDEN HOHENSTRAHLUNG

(MEASUREMENTS ON THE LIMIT OF THE PENETRATING ALTITUDE OF SHORT-WAVE RADIATION)

By E. Regener

Die Naturwissenschaften, vol. 11, March, 1929, pp. 183-185.

Regener performed measurements of the altitude of penetration of liation by lowering into Lake Constance, at a depth of about 340 meters, ecial self-registering apparatus, as this is the sole means to overcome the hnical difficulties of this kind of measurements. A steel bomb with walls centimeter thick and 39 liters in volume was used. The bomb was filled with rbonic acid at a pressure of 30 atmospheres.

The central electrode was provided with a unifilar electrometer of ecial construction. The return of the electrometer, which was charged at 0 volts, was registered by a photographic plate every hour. The registra- ons made at different depths are given in a figure which shows the decrease ionization with the increase of depth.

Special arrangements were made to prevent any possible movement of e apparatus lowered into the water. Values of ionization at various depths e given in a table.

The length of the wave was calculated from the absorption coefficient. using Compton's formula the length of the wave was equal to 4.6 by 10^{-13} ntimeters; by using Dirac's formula, 2.74 by 10^{-13} centimeters, and by using lein and Nishina's formula, 0.6 by 10^{-13} centimeters.

The purpose of hourly registrations performed in the course of two ys consisted of obtaining mean values of ionization for different depths. small depth variations of radiation were especially distinct. -- W. vazoglou.

7. UNCLASSIFIED METHODS

GEOPHYSICAL METHODS OF PROSPECTING, PRINCIPLES, AND RECENT SUCCESSES

By C. A. Heiland

Quarterly of the Colorado School of Mines, vol. 24, No. 1, March, 1929, 163 pp., 65 figs.

The purpose of the paper is not only to describe the fundamental principles of geophysical prospecting, but mainly to demonstrate the actual extent and recent successes of geophysical methods on this continent. The table of contents comprises the following headings: Introduction, significance of geophysical prospecting, possibilities and limitations; classifications of geophysical methods; gravity methods, magnetic methods, radioactive methods, geothermal measurements, seismic methods, electrical methods, underground geophysical prospecting; depth reached with geophysical methods, cost of geophysical work; statistical section, list of consulting geophysical companies and geophysicists and of manufacturers of geophysical instruments; statistical review of recent geophysical activities in United States, Mexico, and Canada; and list of counties in which geophysical work has been done.

This pamphlet contains a mine of information; much reference material is embodied in it, and the reviewer himself refers to it rather often. An elementary understanding of the various methods can be gotten from it by anyone who has a modest knowledge of physics, but the oil man and geologist may find the exposition of the various methods somewhat involved. It succeeds, however, in giving a most vivid picture of the magnitude and extent of geophysical prospecting in this country at present, although the picture of the success of the methods is painted a little overbrightly.

The following detailed criticism is pertinent within the fields with which the writer is especially familiar:

Page 7: The possibility of the location of petroleum directly by any gravity method, no matter how close to the surface, is doubted by the reviewer.

Pages 27, 28, and 29: The gravity minima at Orange and Welsh much more probably represent deep salt domes than by lows in the pre-Tertiary surface.

Boling has been a productive dome for several years.

The comments on Markham and Damon Mound are reversed.

Page 31: Boling, the richest known sulphur deposit in the world, is omited from the list of the sulphur domes.

No. E9 and E56, Gulf Sulphur and Big Hill-Matagorda are identical.

No. E47, Raccoon Bend should be classed under A, Presence of dome t yet proved.

Group II, "Gulf Coast salt domes discovered by torsion balance," cludes one old known dome (Davis Hill). Two prospects which were never gen- ally accepted as probably salt domes (Dickinson and Youngs Ranch), and others ich are not generally accepted definitely as probable domes.

Page 32: Many of the domes listed are of doubtful probability, and . A4 Ferguson (Clay Creek or Gay Hill) was discovered on the basis of surface ology, not by seismic work, although it was checked by the seismograph before was drilled.

No. A5 Hankamer is a (now productive) dome discovered by the torsion lance, not the seismograph, and was condemned by the latter.

No. B17 Boggy Creek was discovered by geological work and core drill- g, not geophysical work.

No. C37 Bayou Henry was the temporarily successful attempt to attract d hold the attention of rival scouts to an area when there was nothing of terest. It was soon checked and condemned by all companies.

No. C46 is a torsion balance prospect.

Page 36: The maxima over many salt domes is due not only to the fects of the cap rock but also to the upper part of the salt. On some of e shallowest domes, the top of the salt is 0.2 to 0.3 heavier than the sur- unding sediments.

"The coastal effect and the effect of the pre-Tertiary land surface" ould not be stated so dogmatically. The reviewer doubts them very much. present, they are extremely small. It is much more probably a question of e conformation of the salt series in depth.

Page 37: The question of maximum versus minimum in connection with e salt domes and oil fields seems to the reviewer very plainly to be the fect of differences in form, depth, and shape of the salt core (and in the allower domes, of the cap rock).

Page 43: Typographical errors, Northam - Wortham, and Leguin - Seguin.

The excellent work with the torsion balance on the Mexican salt domes not mentioned. The legends of figures 19 and 20 are interchanged.

Page 60: Reconnaissance prospecting for salt domes in the Gulf Coast and has been done extensively with the torsion balance. At the present ut half of the torsion balances of this country are in the Gulf Coast, most- on reconnaissance for salt domes.

Pages 59 to 76: A somewhat more optimistic impression of the success the magnetometer will probably be obtained from these pages than perhaps is rranted.

Page 82: The extensive series of measurements by the American Petroleum Institute fellows, unpublished as yet, but generally known to the oil fraternity, has been overlooked.

Page 85: The suggestion that a supersensitive seismograph with large amplification will allow a considerable reduction in the amount of dynamite does not work out in practice, as a micro-ground unrest puts a very definite limit to sensitivity and amplification.

Pages 92 to 93: The same comments about Gulf Sulphur, Big Hill Matagorda, Raccoon Bend, and Davis Hill hold as before.

Page 94: The same comments hold as for the same list on position, page 32. It is a very uncritical listing of supposed discoveries.

Page 96: The Geophysical Research Corporation was started in 1925.

Page 128: The depths reached by the torsion balance and seismograph are much understated. It is size versus depth which counts with the torsion balance. In many places the torsion balance seems to be mapping batholiths in the basement whose relief may be several miles and the surface of the basement itself may be at a depth of 10,000 feet. Salt domes which do not rise to within 4,000 feet of the surface probably can be mapped; at least we think we are mapping salt domes which may not rise within 6,000 feet of the surface. The seismograph companies think that they are working well below 5,000 feet (15,000 feet in California; 12,000 feet in southeastern Texas).

The faults and lacks of this paper largely arise from the facts that its scope is so enormously broad and that it apparently was rather hastily written. It falls just short of being a most excellent paper. The reviewer recommends it to any one who wishes to get a vivid picture of the magnitude and extent of geophysical prospecting. -- Donald C. Barton.

APPLIED GEOPHYSICS IN THE SEARCH FOR MINERALS

By A. S. Eve and F. A. Keys:

Cambridge University Press, 1929, 253 pp., 92 figs.

This book is recommended as an easily readable textbook for elementary classes in geophysics and as an interesting and readable account of geophysical prospecting for the layman. The geophysicist specializing in one or two methods will find much of interest in it. Although elementary, it has considerable depth. It describes the instruments and methods of the magnetic, electromagnetic, electric, and seismic methods in relatively simple terms, in pleasingly readable English, and with restraint against too much superfluous detail and too much highbrow conciseness. Not all parts of the discussions of the mathematical theory will be followed by the average engineer or student without assistance. Many of the comments on the seismic method are considerably out of date. The connection of micropaleotology and diamond drilling with geophysics seems rather slight and not so close as the unmentioned petrography. -- Donald C. Barton.

THE HISTORY OF MAGNETIC AND ELECTRICAL PROSPECTING FOR ORE

By Hans Lundberg

The Mining Magazine (London), vol. 41, No. a, August, 1929, pp. 75-78.

Magnetic prospecting for iron ores was first used in Sweden early in e seventeenth century. The miner's dip needle compass was introduced toward e end of the eighteenth century. A great improvement came in the middle of e nineteenth century with Thalen's work on the theory of magnetic prospecting d Thalen and Tiberg's inventions of their magnetometer and inclinator. Mag- tic prospecting was first used in America, and was successful in New Jersey d New York. Subsequently magnetic prospecting was used extensively in the ke Superior district.

The natural earth electric currents in ore deposits were first de- cted by Robert Fox in 1830 in England. These currents were investigated in 44 by Reich in Germany and by Barus in Nevada in 1880. Attempts to use gal- nic current in prospecting were made in the 1860's. Williams, an Englishman, d Daft, an American, did much experimentation with the use of alternating rrent toward the end of the nineteenth century. The first discovery of ore electric prospecting was made by Muenster of Norway in 1907. Schlumberger 1912-13 developed his natural earth current method. The Daft and Williams thod was tried out in Sweden in 1907 and in 1912. Bergstrom in 1915 intro- ced the equipotential method. A more powerful method using linear electrodes s perfected by Lundberg and Nathorst in 1918. The electromagnetic method s first suggested by Trustedt of Finland in 1904 and first experimented with Lowy and Leimbach in Germany in 1910-1911. The first important experimental k was done by Conklin of America in 1917. The first discovery of ore in erica with electrical methods was made by Swedish engineers in 1924. -- nald C. Barton.

GEOPHYSICAL NOTES

The Mining Magazine, vol. 40, No. 2, August, 1929, p. 68.

The Imperial Geophysical Experimental Survey under the direction of . Broughton Edge has been making an extensive field investigation of geophys- al methods in Australia. Gravimetric surveys of the Victoria brown coal ield and of the Lakes Entrance oil district. Electrical surveys have been ade in several mining districts. Seismic prospecting is being carried out in he Gulgong gold district. -- Donald C. Barton.

EARLY GEOPHYSICAL PROSPECTING

By William R. Jones

The Mining Magazine, vol. 40, No. 6, June, 1929, pp. 348-351 (conclusion); see also Geophysical Abstracts 4.

Before 1861 Mallet had made an extensive study of the speed of trans- ission of elastic earth waves through different formations both by field

experimentation with artificial explosions and laboratory determinations of the compressibility and modulus of elasticity of different rocks. His study included that of anisotropism. Milne at the end of the century modified some of Mallet's deductions and as far back as 1893 experimented with elastic earth waves produced by falling bodies. The magnetic determinations of Lloyd, Sabine and Ross in Ireland in 1834-1835 contributed much to the foundation of our knowledge of terrestrial magnetism. Fox in 1865 invented a dip needle which was used for geophysical prospecting. Rücker and Thorpe somewhat later, Field and Harker in 1918, and Strahan and Cox in 1918 connected magnetic anomalies and geologic structure. Fox was the father of geoelectric prospecting; but Walker in 1882, Lamb in 1888, Hughes and Rücker in 1892, made important contributions, and the present application of geoelectric prospecting is to a considerable extent a modification of Daft and William's method of 1902. -- Donald C. Barton.

EAST TEXAS GETTING GEOPHYSICAL PLAY

By R. Van A. Mills

The Oil and Gas Journal, vol. 27, No. 45, March 28, 1929, pp. 36 and 84.

This is a brief, journalistic, somewhat disconnected account of the impressions gained by discussions with various geologists and geophysicists at the Fort Worth meeting of the American Association of Petroleum Geologists in March, 1929. -- Donald C. Barton.

"WATER DIVINING"

By J. W. Gregory

British Waterworks Association Congress, 1927, 22 pp.

This paper contains an interesting, critical, somewhat historical résumé of the use of the wigglestick for the location of water. The cases which are given by Bunett and Sherman (1933) and by Mayer (1930) as especially convincing for water divining, independent tests of water divining in South Australia, New South Wales, Victoria, England, West Africa, and an interesting test by the Anglo-Persian Oil Co. of oil-divining of the presence of tins of oil buried within 12 inches of the surface are briefly described and critically reviewed. Professor Gregory concludes that the survival of the use of the divining rod in the search for water after the abandonment of it for its many other uses (for hunting witches, murderers, etc.) is due to the presence of shallow supplies of water abundantly but irregularly scattered, the quickness of some observers in detecting faint surface clues to their position, and to the fact that the success apparently scored in many areas is due to the wide distribution of ground water and the failure to drill in the localities condemned by the wigglestick. The movement of the wigglestick is attributed to usually unconscious muscular movements of the wigglestick operator. -- D. C. Barton.

GEOPHYSICAL SURVEYS IN VENEZUELA

By G. Jeffreys

O'Shaughnessey's South American Oil Reports, vol. 4, No. 2, June, 1932, pp. 2-3.

A brief statement is given in regard to the rather extensive amount geophysical work which is being done in Venezuela, together with interest- pictures of a seismic truck at work, a sketch map showing the areas being vered geophysically and areas which are suitable for survey, and a table wing the companies doing the geophysical work, the number of instruments, the area in which the work is being done. There are apparently about 20 -instrument torsion balance parties, some five or more magnetometers, and r seismic troops being used in Venezuela. -- Donald C. Barton.

GEOPHYSICS REVEAL VAST PETROLEUM DEPOSITS IN COAST REGION

By Jack Logan

Oil Weekly, vol. 71, No. 1, Nov. 10, 1932, pp. 40-50.

According to the author, during a period of a little over four years nce the beginning of practical use of the torsion balance and seismic instru- nts, 51 domes have been found with those instruments in the coastal country Texas and Louisiana--22 in Texas and 29 in Louisiana. Only 41 domes were scovered in the Gulf Coast and without the aid of geophysics during a period about 25 years.

All of these 51 new domes are shown in the accompanying maps; in the comparative tables the data are arranged in alphabetical order of the coun- ies in which they are located.

The author considers that, of course, it does not follow necessarily at all salt domes yield oil production.

According to rough estimate of cost expended in finding the first domes by geophysical methods, the total was around $17,000,000. This is average cost of $ [illegible],000 for each dome found.

During the five years from the discovery of the Hagen-Martin Dome in uisiana, to the discovery of Big Creek in 1928, approximately 675 wildcat sts were drilled in the Gulf Coast area in search of new domes. The cost drilling those 675 wildcats has been estimated at $20,000,000 exclusive the cost of leases and overhead expenses. Twenty million dollars for find- one dome which is now producing 2,200 barrels per day. That is the record r the old methods, as compared with the above-mentioned record for geophysi- l prospecting of $17,000,000 for finding 30 domes, including eight which are producing about 2,000 barrels.

All the discoveries were made by using torsion balance and seismo- aph.

50

As an indication of the importance which geophysical prospecting has assumed in the Gulf Coast region, Logan points out in the last part of his article its relation to the present field of activity. -- W. Ayvazoglou.

LES MÉTHODES GÉOPHYSIQUES POUR L'ÉTUDE DES COUCHES SUPERFICIELLES DU SOL

(GEOPHYSICAL METHODS FOR STUDYING SUPERFICIAL DEPOSITS)

By Ch. Maurain

La revue pétrolifière, Nos. 322 and 323, May 25 and June 1, 1929, pp. 705-708, 745-749.

Geophysical methods of prospecting are summed up in the article. Maurain concludes that these methods are a valuable contribution to geology in studying the layers of the earth's crust from the scientific as well as practical viewpoints.

With the improvement of the instruments and theoretical progress of the methods, the value of geophysical prospecting will increase constantly.

The author notices that the problem of geophysical prospecting is often simple and can be used with great advantage--for example, for determining the extent of deposits of which one part is already known. Gravimetric and magnetic methods are especially recommended in this case. The problem may often be solved indirectly also, especially for discovery of oil, as geological formations which usually accompany the oil deposits (salt domes) may be established by geophysical methods of prospecting.

A large number of articles on geophysical prospecting is mentioned. -- W. Ayvazoglou.

GEOPHYSICAL INVESTIGATION OF BAUXITES IN JUGOSLAVIA

(In Serbian)

By Vsevolod Gorsky

Rudarski i Topionichi Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, No. 8, August, 1929, pp. 350-358.

The author examines the question of whether geophysical methods of prospecting can be used for the discovery of bauxites in Jugoslavia, especially in Dalmatia.

Based on indirect conclusions, drawn from the consideration of chemical composition and general physical properties of bauxites and the rocks with which they are found (mainly limestones), the author is of the opinion that in some cases the magnetic and electric methods of geophysical prospecting may be used.

The problem can, of course, be definitely solved only after detailed periments in geologically well-known bauxite deposit regions are made. These periments will probably soon be started by the Institute of Mining Survey and odesy at the University of Ljubljana.

A bibliography is added to the article. — Author's abstract.

QUEENSLAND GEOPHYSICAL SURVEY, LIMITED, BRISBANE

Petroleum, vol. 25, No. 10, March, 1929, p. 337.

The first geophysical survey company has been established in Australia der this name, with a capital of 100,000 pounds. Its main office is in the urier Building, Brisbane, Queensland. The foundation resulted from the con- act negotiations between a number of Australian Oil Concerns with the German lbof Prospecting Co. in Cassel and the firm of Piepmeyer and Co.

According to the contract the German firms provided the Queensland mpany with experts, as well as with necessary instruments for accomplishing e combined geoelectric, magnetic, gravimetric, seismic, radioactive, and othermal investigations. The first party, consisting of four geophysical perts and two technical assistants, has already started its work in the Roma l fields in Queensland. A similar second party has departed from Hamburg ready in the beginning of this year. The term of contract is two years.

An Elbof Prospecting Co. party has been working also since 1927 in w Zealand. The party is equipped with all the modern instruments for geo- ysical methods of prospecting.

In New Zealand and especially in Australia, in which countries more han 200 oil-concession companies were formed during the last two years, the dern geophysical methods of prospecting have aroused great interest. -- W. vvazoglou.

8. Geology

DIE GEWINNUNG VON ERDÖL, MIT BESONDERER BERÜCKSICHTIGUNG DER BERGMÄNNISCHEN GEWINNUNG

(THE WINNING OF OIL WITH SPECIAL REFERENCE TO THE WINNING BY MINING)

By Gottfried Schneiders

Julius Springer, Berlin, 1927, 356 pp., 295 figs. Price 32 marks.

Only a rather small fraction of the oil contained in the ground is -day being recovered by drilling. Depending on local conditions, the pore olume of the ore bearer, and the viscosity of the oil, this fraction as an aver- ge can be taken to be between 15 and 25 per cent of the total oil content of he deposit. The recovery by drilling alone, therefore, is at least as waste-

ful as that which formerly took place in mining of ore deposits by taking out only the high-grade ores. Besides poorly cemented water horizons or breaks in such cements or in the casing left in the ground may allow water to enter the deposit, so that its remaining oil content will be lost forever.

Various estimates of the oil resources of the world have been made and, although none of these estimates could be really accurate, they showed that with our steadily increasing demand, within a measurable space of time our recovery of oil by drilling will be at an end. Then we will have to return to our old oil fields and recover the remaining, and by this the major, part of their oil by mining.

Shortage of oil has not yet been felt in this country. But in Europe, where the smaller deposits could not meet the demand, especially with the high import duties on crude and refined oil (for the protection of local industries), extremely higher prices and better market conditions have resulted and mining of oil has become profitable. Besides, the markedly lower wages allow undertakings in Europe which present conditions in the United States render fundamentally impossible.3/

The author of the above-named book probably has had more practical experience in the mining of oil than any other person. A mining engineer by education; he was put in charge of mining operations at Pechelbronn, Alsace during the world war and under his supervision several shafts, 500, 510, and 720 feet deep, were sunk and underground mining started before the war was over and Alsace surrendered to France. Mr. Schneiders then supervised the sinking of a shaft of about 935 feet in the oil field of Wietze, Hannover, Germany, where the "Deutsche Erdöl A. G." began mining operations in a known field on the edge of a salt dome. These operations have turned out to be very profitable. Then in the employment of the "Deutsche Petroleum A. G.," Mr. Schneiders sank a shaft of about 280 feet at Heide, Holstein, Germany, where a large block of white chalk highly impregnated with heavy oil was to be mined and has been in charge of mining operations at Heide for several years. Later several trips brought Mr. Schneiders to Austria, Japan, India, etc., where such mining operations were also to be started under his supervision.

The results of these years of practical experience have been noted in the Schneider's book, which is now the most complete textbook, on the mining of oil deposits. Besides, it is a purely practical book, written for the practical man in the field, with numerous technical advices for actual operations. Reference to the literature is given wherever necessary, but the former literature on this subject is very poor. No attempt is made to discuss the mining of oil shales, as the author is of the opinion that mining of oil deposits is much more profitable than the oil-shale industry. This is due especially to the greater amount of oil left in even exhausted oil fields.

Starting with a brief geological introduction on the occurrence and methods of searching for oil, first the methods of its recovery by means of the drill are discussed. Some details on the machinery used and drilling

3/ Attention may be drawn here to the mining of oil at Jacksboro, Tex., (Oil and Gas Jour., Oct. 7, 1926) and to the article by Ed. Bloesch, Bull. Am. Assoc. Petrol. Geol. April, 1926, p. 405.

hods are given and discussed and the methods of recovery of oil through ll holes briefly outlined.

The main subject of the book then follows--the winning of oil by ning. This section goes very much into detail. As the result of practical erience and theoretical investigations it is shown that only a small fraction of the oil is recovered by drilling and the importance of oil mining in future is pointed out. Besides, drilling is always a rather risky proceed- for a drill hole may or may not strike the pay horizon and even when doing may find it dry or the oil replaced by water. Mining in fields that are ll known from former drilling operations, on the other hand, is relatively fe, for the amount of oil left in the deposit and recoverable by mining can computed fairly accurately, and actual estimates of expenses and profits be made in advance. Recovery of oil by mining, therefore, will put the l industry on a sound commercial base.

After a brief historical introduction, the methods of sinking a shaft an oil field are discussed in detail. Various forms of such shafts are ren, as well as the requirements for the future operations, the machinery be used, and the precautions to be taken. A special chapter deals with e interior fixings of the shaft with results of experience.

After the shaft has been sunk, tunnels and galleries have to be to win the oil and to start mining. The recovery takes place in two stages: st, recovery of oil seeping into the galleries; and second, mining the oil- rer with its oil. The amount of seep will depend on the pore volume of the l-bearer and on the viscosity of the oil itself, for which certain estimates l computations can be made in advance. The amount of seep can also be artificially increased,--for example, by means of short drill holes,--but even thout doing this, recovery can reach a considerable figure under favorable ditions. Practical experience in Pechelbronn, Alsace, has shown that ordiry drilling operations allowed the recovery of a total of 21.8 per cent of e oil contained in the sandy deposits, seeping into galleries gave additional .1 per cent, and mining operations supplied the remaining 38.1 per cent. ese figures naturally hold only for this local case and will vary from deit to deposit.

At Heide, Holstein, for example, the pores of the oil-bearer were so all and the viscosity of the oil so high that hardly any recovery could be ceived through ordinary drilling and from seeps, and nearly all of the oil d to be recovered by mining the deposit. It may be added that the flow oil to the bottom of a well is fundamentally the same as the seeping into e galleries. Realizing how much greater the surface of a gallery is as comred with that of a vertical drill hole, it will be understood how much more fficient the seeping into galleries will be.

Gas is an important factor in oil mines. Even though the major rt has been taken out of the deposit by former wells, a considerable amount gas may still remain and by its highly explosive quality and trait of accumulating unexpectedly constitute a continuous danger for underground operations. wever, when the necessary precautions are taken, mining of oil is not more ngerous than mining of coals with the danger of fire damp. The danger is

greatly reduced when the gas is removed in advance by means of short holes drilled underground ahead of the workings. Then the gas recovered can even be utilized. Another still more dangerous gas is that originating from evaporation of the oil. Every such evaporation, therefore, should be suppressed as far as possible.

A special chapter is devoted to the interior arrangement of the galleries and tunnels. Whereas the oil deposits frequently have been found rather loose, the walls will not stand by themselves and have to be supported. The material has to be fireproof, and no wood should be employed for this purpose (as far as possible no burnable material should be used in any oil mine). The different types of fixings are described in detail and it is shown which type is most suitable under the different conditions. Advantages and disadvantages of all types are discussed and approximate costs given based on European conditions.

Several methods can be used for the mining of the deposit. Where applicable, hydraulic mining seems to be best and most economic method, to be used in a similar way as the underground hydraulic mining of placers in California. Another method uses dredges, etc. Manual labor should be excluded as far as possible, not only to cut expenses but also to have as few men as feasible work in these dangerous surroundings.

Then the products mined have to be hauled. No fire nor even electric engines should be used. Compressed-air engines seem to be best in many respects. Every possibility of creating sparks by electric discontinuation, by hitting hard rocks, especially flint, etc., with picks and shovels, or by the striking of horseshoes on iron rails or ties should be avoided, as fire or even explosions may be started in such ways.

The most important factor in oil mines is the ventilation. On its reliability the safety of the mine depends to a large extent. Continuous observation of the air, therefore, is absolutely vital, but if such observation is made in the proper way, then the dangers are greatly reduced. The fact that Pechelbronn and other oil mines have not had greater disasters than certain coal mines shows what strict attention to overcoming hazards can do. Means of ventilation are discussed, and formulas and figures for the amount of fresh air needed and power required are given. A special chapter is added discussing the possible causes of fires, their isolation, and prevention. Also means of rescue in case of disaster are discussed.

The treatment of the product mined, that is, the separation of the oil from the oil-bearer, can be carried out by several methods. For oil sands washing with warm water with a large excess of water seems to be best and most economic.

The economy of oil mining is briefly discussed, and it is shown that (varying slightly with local conditions) in Germany oil contents exceeding 14.2 to 16.4 volume per cent of oil in the deposit already will yield profits. This is far below the amount of oil usually remaining in exhausted fields. A detailed subject index finally facilitates the use of the book.

This publication is interesting not only for the oil man but also for ing engineers, especially those dealing with mining of coals. Unfortunately contains a great number of technical expressions which will make it diffi- t to read for those not especially familiar with technical German. Many of se expressions, however, have been briefly explained, and their use could very well be avoided in a technical book.

The machinery referred to and shown in the numerous pictures, with exceptions, is of German origin and manufactured in Germany. It might be gested that in a new edition and especially in case the book should be nslated, reference also should be made to machineries manufactured in other ntries, especially in the United States. At any rate the book is a most wel- e contribution to the oil industry. Even if the recovery of oil by mining present does not look profitable to operators in this country they should low the development, for the time will come when here also such operations l have to be started. -- E. U. von Buelow.

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GEOPHYSICAL ABSTRACTS[1]

No. 8

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHOD

DIE REDUKTION DER KOINZIDENZZEITEN VON PENDELN ZUR BERECHNUNG VON SCHWEREDIFFERENZEN

(CORRECTION OF COINCIDENCE MOMENTS OF PENDULUMS FOR THE CALCULATION OF GRAVITY DIFFERENCES)

By H. Schmehl

Zeitschrift fuer Geophysik, Heft I, 1929, pp. 1-16.

The most common proceedings for calculating the correction of gravity observations made by pendulums such as the determination of the observed times of oscillations of a pendulum from the observed coincidence moments, the reduction of the observed times of oscillation to equal ratios, and the calculation of the relative gravity from the reduced differences of the time of oscillations, are replaced by reduction of the observed coincidence moments to equal ratios and calculation of relative gravity from the reduced differences of the coincidence moments. The reduction formulas are usually derived for the reduction of observations of 1/i second pendulums. In addition to the one-pendulum proceeding, the two-pendulum proceeding is taken into consideration also. Numerical examples serve for the explanation of the correction.--Translation of the author's abstract.

BEITRAG ZU FRAGE DER BEWERTUNG DER VERSCHIEDENEN SCHWERESTOERUNGEN

(CONTRIBUTION TO THE QUESTION OF THE ESTIMATION OF VARIOUS GRAVITY DISTURBANCES)

By Johannes Wilhelm

Abhandlungen der Preussischen Geologischen Landesanstalt, Berlin, Heft 10, 1928, 50 pp.

The fact that the evident mass anomalies in the subsoil are more or less compensated by isostasy is at the present time indisputable. This distribution of masses is in general proved by gravity measurements. There are two hypotheses by which the manner of compensation is explained: Pratt's hypothesis and Airy's hypothesis. Attempts based on gravity measurements to reach a common definition of the hydrostatic system, as given by Pratt or Airy have failed. To make a decision between Pratt and Airy based on gravity measurements only seems to be impossible at the present time.

The correctness of the isostatic method of reduction as concerns the exact definition of the hydrostatic system, however, must be considered to be no higher than that of ordinary methods of reduction.

Defects of the isostatic method of reduction depend in the first place on the number and kind of hypothetical assumptions. The importance of the Bouguer anomaly is still maintained, although the direction is different. The diagnosis of the conditions of the masses in the uppermost zones at the earth's sectors is completed by geological interpretation of the gravity

omalies. From this the value of the gravity disturbances necessary for the ologist must be derived. It results that the gravity anomalies provide for e geologist indications on the regional conditions of the masses at great pths on the largest tectonic unities. Local mass disturbances, observed ry close to the surface, which can directly be investigated in a geological y, are not involved in the gravity measurements. This circumstance must be nsidered to be of great advantage. The gravity measurement is very suitable r the first preparatory work necessary for the systematic economic explora- ion of deposits of large areas.

A long list of literature is added.--Author's abstract, translated W. Ayvazoglou.

COMPARISON OF TORSION BALANCE AND GEOLOGIC INTERPRETATIONS OF OUTLINE OF BLUE RIDGE SALT DOME

By Jack Logan

The Oil Weekly, Vol. 55, No. 4, Oct. 11, 1929, pp. 37-41.

After mentioning a series of oil discoveries made with the torsion lance in the Gulf Coast fields since 1923, and dwelling especially on the ree commercial wells completed since August 15, 1929--the Esperon Domes and e Mykawa well, the first two daily producing 400 barrels of oil from a depth 3,304 to 3,320 feet and 175 barrels from a depth of 2,270 to 2,276 feet, d the third producing gas from a depth of 4,189 feet--Logan describes the rsion balance survey of the Blue Ridge Dome, Fort Bend County. The results the work are shown in curves and maps. A graphic comparison of the torsion lance and geologic interpretations of the outline of the dome is given.

The torsion balance survey was made in 1925 by the North American ploration Co. The results of that torsion balance survey were worked into e accompanying drawings along with the geologic section by John F. Weinzierl Houston. A map of leases and ownerships with the producing wells around e dome, forming a near-circle, is given.

The dotted curve shows the outline of the dome as revealed through e torsion balance survey. The torsion balance outline shown on the owner- ip map is a projection on it of the gradient map shown in another figure.

Figures showing "gradient curves" and "geologic sections" reveal the ose conformity between the shape of the dome as shown by the logs of wells d through the torsion balance work.

The torsion balance interpretation of the outline of the dome con- rms with startling accuracy to the geologic interpretation.

A brief description of the torsion balance work and the principles on which it is based are given in the article.--W. Ayvazoglou.

ASTRONOMERS COMPLETE GRAVITY COMPARISON

Editorial Note

Canadian Mining Journal, No. 41, Oct. 11, 1929, p. 960.

A series of pendulum observations at base stations in Europe and America has been completed by the Dominion Observatory in Ottawa. This work is considered to be the most accurate gravity comparison ever made between the two continents.

The selected stations were: The Dominion Observatory, Ottawa, which is the gravity base for Canada; the Royal Observatory, Greenwich, the base for Great Britain; the Geodetic Institute at Potsdam, Germany, the base station to which all gravity stations throughout the world are referred; and the Coast and Geogetic Survey Office, Washington, the base for the United States.

The purpose of the work was to determine the gravity relation that exists between Ottawa and the bases mentioned.

From the scientific point of view, the results of the work are important in connection with the question of the shape of the earth as well as of the general equilibrium of the earth's crust.

According to the results of the determinations, the general equilibrium is found to be more complete and the equator more nearly circular than previous international gravity observations would indicate.

From the practical point of view the determination of gravity has been found to be important in the discovery of minerals and the tracing of geological structure.

The determinations were made by allowing a pendulum to swing freely in an air-exhausted chamber for a period of two weeks and determining accurately at each place how much the pendulum lost or gained. It was found that on taking the pendulum from Ottawa to Greenwich the pendulum gained about 2 minutes and 50 seconds per week; at Potsdam, about 3 minutes and 42 seconds; at Washington it lost about 2 minutes and 36 seconds in the same time. The comparative values of gravity at the four bases have been determined from these results.--W. Ayvazoglou.

2. MAGNETIC METHODS

CONTROL AND ADJUSTMENT OF SURVEYS WITH THE MAGNETOMETER OR THE TORSION BALANCE

By Donald C. Barton

Bulletin of the American Association of petroleum geologists, vol. 13, No. 9, September, 1929, pp. 1163-1187.

Some degree of residual error is present in practically every observation made with a magnetometer or a torsion balance. Errors of some types

n be avoided, or greatly reduced, by careful technique of observation. Other rors can be reduced by the application of corrections, but in general some sidual error will persist. Errors in isolated or widely separated observaons, or, in general, in single lines of stations, are not detectable or at ast are not easily evident. But if the stations are so placed that there e closed circuits of observations, the errors generally produce more or less scordance.

Adjustment of mutually discordant systems, or sets of stations, is cessary for their satisfactory use for all but the rougher interpretations. e adjustment gives a probable value for each station with due regard to l of the observations more or less mutually affecting it. Various types of ntrol and adjustment are in use. The method of least-square adjustment is e most accurate of the methods of adjustment, but requires at least moderate thematical skill and is distinctly tedious. But for the degree of accuracy commercial geophysical work in oil geology, certain approximate schemes of ast-square adjustment can be cast in simple tabular forms which are easy to e and which require no knowledge of higher mathematics.--Author's abstract.

SIMPLE MAGNETIC METHOD FOR ORE PROSPECTING

By Hans Lundberg

Canadian Mining and Metallurgical Bulletin, July, 1929, 9 pp.

The present article is an attempt to help the prospector regain terest in the magnetic instruments and to show the use and application of a mple magnetic survey; most articles written on magnetic methods of prospectg are generally too elaborate and technical for the average prospector and us have caused a great deal of disappointment.

Simple methods are investigated and an analysis is made of the results tained by these methods.--W. Ayvazoglou.

THE VARIATION OF MAGNETIC ANOMALIES

By W. N. McFarland

Terrestrial Magnetism and Atmospheric Electricity,
vol. 34, No. 2, June, 1929, pp. 143-146.

This paper describes briefly a method of isogonic-chart construction, d the distribution of station anomalies, or differences of observed values om the average condition shown by the chart. The distribution is shown be according to the law of occurrence of accidental errors. The available ta are given in a table, and a figure shows the correspondence of observapnal data and theoretical curve in an individual case.--Author's abstract.

THE MAGNETO-CHRONOGRAPH AND ITS APPLICATION TO MAGNETIC MEASUREMENTS

By H. E. McComb and C. Huff

Terrestrial Magnetism and Atmospheric Electricity,
vol. 34, No. 2, June, 1929, pp. 123-141.

The period of a magnet oscillating under the directive force of the earth's magnetic field is a function of the strength of that field. Heretofore the estimation of the period has been accomplished by eye and ear readings but in the present method the personal equation is entirely eliminated. Light from an intense source such as an automobile headlight lamp is condensed on the glass-scale end of a magnetometer magnet, and afterward reflection is focused on a slit in front of a photo electric cell. The reflected beam acts as an optical lever whose period is the same as that of the magnet but whose amplitude is twice as great. At each transit of the image across the slit, current is passed by the cell, and after passing through amplifiers is made to operate a pen on a chronograph.

A chronometer in the circuit marks seconds on the record by the same pen. In this investigation the method was applied in the determination of the moment of inertia of a magnetometer magnet, estimation of personal equation in eye-and-ear readings, and in preliminary tests of the relative absolute magnetometer.—Author's abstract.

THE MAGNETIC FIELD OF BODIES OF REGULAR SHAPE FROM THE VIEWPOINT OF MAGNETOMETRIC STUDIES

(In Russian)

By J. Bahurin

Bulletin of the Institute of Practical Geophysics,
Leningrad, No. 4, 1928, pp. 1-79.

This paper is a continuation of the article printed in issues Nos. 2 and 3 of the same bulletin (See Geophys. Abs. 1).

Chapter III deals with the "Oblate ellipsoid of revolution magnetized by forces not parallel to the axis of rotation (oblique magnetization)." The author concludes from the theoretical calculations that an oblate ellipsoid of rotation and an elliptical cylinder with an infinitely long axis are magnetized equally if the sections along the axis of rotation of the ellipsoid and that perpendicular to the axis of the cylinder are similar.

In the further part of this chapter Bahurin examines the questions and derives formulas concerning the following items:

1. The distribution of the magnetism along the surface of the ellipsoid.

2. The value of the horizontal component of the intensity of magnetization.

3. The potential and the component forces of the action of the oblate ellipsoid of rotation in case of oblique magnetization.

4. The changes of the horizontal component in the XOZ plane (in case of negative X and positive X).

5. The changes of the vertical component in the XOZ plane (in case of positive X and negative X).

6. The changes of the vertical and horizontal components in the ZOY plane.

7. The triaxial ellipsoid.

ny tables are included in the article.--W. Ayvazoglou.

ANOMALIES OF VERTICAL INTENSITY COMPARED WITH REGIONAL GEOLOGY FOR THE STATE OF CALIFORNIA

By George B. Somers

The Colorado School of Mines Magazine,
Sept., 1929, pp. 22-28.

The article is a preliminary report prepared by the author for the rpose of obtaining information regarding methods of procedure and the possi- lities of utilizing the data available for a thesis on the correlation of e anomalies of vertical intensity with the regional geology of North America.

After a brief description of the morphological conditions in Cali- rnia and of the statigraphy and formations of rocks, the author gives an tline of the geological history of the following regions: 1. Basin and nge; 2. Sierra Nevada; 3. California valley, and 4. Coast range region.

The source of information of the magnetic stations in California was e map of the western half of the United States which showed the vertical tensity of the magnetic stations of the region based on data obtained in 1925.

As this map gave only the actual vertical intensity at each station, order to show the true anomalies it was necessary to make a correction for e changes in vertical intensity due to changes in latitude and longitude.

The method of doing this, selected by the author, is described. A ble showing the magnetic correction for latitude and longitude for 156 ations is given. The conclusions drawn by Somers are summed up as follows:

1. The method used in eliminating the natural increase in vertical intensity from south to north and from west to east was satisfactory for this State, though it probably would not be for a larger area. The anomalies were of such magnitude that errors of considerable size would not have changed the results.

2. The regional structure appears to have been brought out to a considerable extent but would undoubtedly have been shown better if the results could have been obtained from a larger number of stations.

3. The producing oil fields are not indicated by the isonomalies, due probably to a shortage in the number of stations.

4. Since similar magnetic and structural conditions appear to exist to the north of the present fields, the possibility of additional fields in that direction is promising.

5. Assuming that the stratigraphy is similar to that in the producing areas, the indications appear to be favorable for additional oil pools along the center line of the California valley.

6. It is once more shown that the correct interpretation of geophysical data depends to a great extent on the study of geological conditions.

7. It is possible to obtain considerable data regarding the regional geology by geophysical methods.

A map showing the isonomalics of vertical intensity of the State of California is given.--W. Ayvazoglou.

MAGNETIC SURVEY IN THE REGION OF NEFTE-CHALA

(In Russian)

By A. J. Zaborovsky

The Petroleum Industry (Moscow),
vol. 16, No. 5, May, 1929, pp. 643-654.

Magnetic anomalies in the regions of oil deposits in Azerbeidjan were established by investigations made during 1926, 1927, and 1928.

These anomalies were found to be due to the presence of magnetic minerals, especially magnetite, in the rocks composing the oil-bearing regions. Zaborovsky gives a table of the distribution of the magnetic minerals in the region examined. The figures of the table show the relative content of the magnetic minerals in the rocks; their absolute amount in the rocks is very small, about 1 per cent on the average, although this amount increases in some places to 35 per cent.

In order to establish the geological structure of the region in places where the direct geologic investigation could not be made, the presence of this magnetic mineral was utilized for accomplishing the magnetic survey. The author describes the two types of instruments used in modern magnetometry for studying anomalies of the order from 100 to 200 γ: (1) The magnetic theodolite and a sensitive dip circle provided with a needle, or an induction

circle, and (2) The local variometer of various construction.

After comparing the advantages and disadvantages of the work with e or the other type of instruments, the author expresses himself in favor the work with the local variometer and gives a description of the principles, nstruction, and the use of different types of variometers.

An expedition was formed by the Governmental Oil Research Institute r a detailed magnetic survey in the region of Nefte-Chala in 1928. The ex- dition was provided with four variometers, two for the determination of the rizontal intensity and two for the determination of the vertical intensity. e instruments were adjusted in accordance with the conditions of the work the region.

The region of Nefte-Chala is situated near the mouth of the river ra on the peninsula bounded on one side by the Caspian Sea and on the other the Kisil-Agach Bay (Caucasus).

The preliminary magnetic investigation performed in 1927 has shown at the zone of magnetic anomalies runs in the direction from southeast to rthwest.

Zaborovsky gives a series of diagrams and maps showing the distri- tion of the components of the magnetic field, on which he bases his summary the results of the magnetometric survey of the region, as follows:

1. The magnetic anomalies in the region of Nefte-Chala are in strict relation with the geological structure of the region;

2. The character of these anomalies, if they are caused by the presence of magnetite in the Tertiary deposits, shows that:

   A. There is in this region an anticline extending in the direction from southeast to northwest;

   B. The line of the axis of the anticline passes to the east of pit-hole 5;

   C. The arch of the anticline sinks gradually toward the southeast;

   D. The northeastern wing of the anticline has a smaller angle of dip than its southwestern wing; and

   E. To the southeast of the line of pit-holes the arch of the anticline rises again. -- W. Ayvazoglou.

3. SEISMIC METHODS

GEOPHYSICAL FOUNDATION STUDY BY EXPLOSION-WAVE METHOD

By A. T. Parsons

Engineering News-Record, Feb. 14, 1929, pp. 273-275.

Parsons mentions the possibilities of applying seismic methods of geophysical prospecting in making foundation explorations at proposed sites for dams, bridges, or buildings.

The explosion-wave method, as it is developed in oil-field work, is described by the author in the article. Several figures showing typical time-travel record and explosion-wave paths from single and successive shots are given.

During the past two years Parson's organization has made subsurface foundation surveys of several hundred square miles in various parts of California. Where it has been possible to compare the results with actual drilling, a close agreement has been observed.--W. Ayvazoglou.

UBER FORTPFLANZUNG VON ELASTISCHEN WELLEN IN VISKOSEN MEDIEN

(ON THE PROPAGATION OF ELASTIC WAVES IN VISCOUS MEDIUMS)

By B. Gutenberg

Physikalische Zeitschrift, vol. 30, No. 8, 1929, pp. 230-231.

According to the theoretical conclusions made by Sezawa, elastic waves become gradually longer and more level during their propagation in viscose mediums. The author finds that under certain suppositions the law of propogation may be written as follows:

Period $T = \sqrt{T_0^2 + CD}$ in which D is the distance and C the constant for the material in question.

This relation has proved to be correct for a series of geophysical proceedings, especially for the propagation of waves of seismic disturbances of the soil, earthquakes, artificial shakings, sea waves, and also correct qualitatively for sound waves, where quantitative results are not available.--Author's abstract.

4. ELECTRICAL METHODS

ELECTRICAL SUBSOIL EXPLORATION AND THE CIVIL ENGINEER

By Irving B. Crosby and Sherwin F. Kelly

Engineering News-Record, Feb. 14, 1929, pp. 270-273.

The adaptation of modern geophysical procedures to important requirements of civil engineering construction is outlined.

The authors describe the practical application of electrical explo-ion to certain foundation problems, demonstrating how effectively it may used for the investigation of bedrock concealed by overburden.

The demonstration of the method was arranged at eight preexisting ings, and the electrical observer was kept in ignorance of the conditions eady encountered in the course of drilling. The results were checked with drill records and found to be satisfactory.

The results of some of the determinations are described in the icle as representative examples. Various graphs show the resistivities culated as a function of depth.

The average accuracy in 10 of the electrical determinations that e directly checked by the drill is shown in the table given below:

Table 1. - Results of electrical determinations directly checked by the drill

e No.	True depth to rock, feet	Predicted depth, feet	Predicted depth in relation to the true depth, per cent
1	29	24	83
7	27	41	151
9	108	108	100
10	100	118	118
11	56	53	95
12	50	43	86
13	101	105	104
14	142	145	104
20	167	115	69
21	147	142	97

Following the tests an extensive exploration campaign was under-ten. The results are not made public, but the campaign provides a basis cost estimates.

Two areas, totaling 250 acres, were surveyed by establishing about points of observation.

From one to three determinations could be made at a cost of $50 to 00 per position.

The total cost of the survey to the construction company was not h more than that of one drill hole in which much trouble was caused by lders.

The authors conclude that the example cited proves the possibility the application of electrical methods to a specific foundation problem.

As far as the authors are aware, this was the first time that the geophysical method of prospecting has been commercially applied in solving civil engineering problems.

The geophysical method of prospecting was applied last spring to the study of two dam sites on the Connecticut River near Littleton, N. H.--A. Ayvazoglou.

EQUIPOTENTIAL LINES OF A NATURAL ELECTRIC FIELD PRODUCED BY A SPHERICAL ORE-BODY

(In Russian)

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 81-89.

In two previous articles, "Natural electric field produced by ore" and "Determination of the location, depth, and thickness of a spherical ore body by observing the earth current produced" (see Geophys. Abs. 1), Petrowsky constructed graphs showing the changes of the potential gradient which occurred in case the observer was moving across the region situated above the ore body.

In addition to these graphs the present article deals with methods of calculation and construction of graphs showing the equipotential lines produced on the earth's surface due to the action of a spherical ore body.

Calculation is made for three cases:

1. For the vertical position of the axis of polarization ($\alpha = 0^\circ$).
2. For an inclined position of the axis of polarization ($\alpha = 45^\circ$).
3. For the horizontal position of the axis of polarization ($\alpha = 90^\circ$).

According to these graphs:

In the first case ($\alpha = 0^\circ$), the equipotential lines of a natural electric field of a spherical ore body are circles, the center of which lies above the center of the ore body.

In the second case ($\alpha = 45^\circ$), a deformation of the curves takes place; the maximum of the potential shifts somewhat forward and the positive equipotential lines are shifted forward at the same time.

In the third case ($\alpha = 90^\circ$), the position of the equipotential lines becomes symmetrical with respect to the axis of ordinates.

The corresponding tables used for the construction of the graphs are added to the article.--W. Ayvazoglou.

MAGNETIC FORCES IN AN ARTIFICIAL ELECTRIC FIELD

(In Russian)

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 92 - 119.

In his article "Calculations of an artificial electric field" (see ophys. Abs. 1), Petrowsky derived formulas for the calculation of potentials d projections of the electric force and showed the methods for calculating em. The present article presents formulas for calculating projections of e magnetic force, as well as the corresponding methods of these calculations.

The mathematical analysis of a magnetic field produced on the surce of the earth by leading-in of the current through one electrode has aady been given by Koenigsberger (Das magnetische Feld einer Stromquelle im um, Physikal. Ztschr., vol. 28, No. 9, 1927, pp. 342-344. Petrowsky examines more general case, that of a magnetic field produced at any point in space, e system of coordinates being changed accordingly.

Using the principle of superposition of fields, Petrowsky derived rmulas by which the magnetic force on the surface of the earth in Schlumrger's, Petrowsky's and Lundberg's fields could be calculated.

The last part of the article gives the methods of calculation of e magnetic forces in Petrowsky's field.

Four numerical examples, completed by two tables, illustrate the oceeding of the calculation. The use of the tables considerably shortens e time necessary for calculations. The article is provided with five igures.--W. Ayvazoglou.

ELECTROMETRIC INVESTIGATION OF THE UPPER ARSHINSK ORE-BED ACCOMPLISHED IN THE SUMMER OF 1927

(In Russian)

By A. Petrovsky

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 121 - 143.

Valuable results obtained from the electrometric investigation of e Upper-Arshinsk ore bed accomplished in the summer of 1926 (see Geophys. s. 1) caused the continuation of the work in the summer of 1927.

Contents of the article:

1. The object of the expedition.

2. Preparation for the expedition.

3. Changes made in the stations.

4. Changes concerning the feeding network.

5. Auxiliary instruments.

6. Changes in the receiving devices.

7. A field bridge for resistance measurement.

8. Electrodes of the bridge and the method of measuring resistances of the rocks on the spot.

9. Area of the work.

10. Cutting of the area into sections.

11. Electrical surveying.

12. Classification of the anomalies. Importance of the specific conductivity of the rocks.

13. Influence of topography.

14. Influence of meteorological conditions.

15. Conclusion.

Work on the following details was included in the plan:

A. Definition of the changes in the course of the equipotential lines caused by the difference of the specific conductivity of the upper layers of the soil.

B. Establishment of topographic influence upon the course of the equipotential lines.

Changes made with regard to generator sets, rods, arrangement of the field bridge, as well as the new bridge itself, are given in figures.

The work of the expedition began from the last station of the previous year, and new stations were added by extension.

The position of the stations is given in a figure. A considerable amount of numerical data has been obtained, but the working out of it is of course delayed, as supplementary investigations in the laboratory are required. However, the authors give in the article several conclusions based on the preliminary examination of the data; they are:

1. The electric field observed in field work resembles, on a whole, a field calculated theoretically.

2. Although the fields are always somewhat distorted, the varieties of these distortions may, to a certain degree, be systematized into groups of wavy, slanting, and curved fields.

After a description of the influence of topography and meteorological nditions, the authors conclude that a careful taking into consideration of kinds of data obtained during the electrical research is necessary, and at it is indispensable, in addition to the survey of the equipotential lines en accompanied by the measurement of the gradient, to accomplish a supple- ntary work by measuring the specific resistivity of the upper layers of the il, the specific resistivity of rocks and other layers which break the homo- neity of the field, as well as of the water in the swamps and basins scatter- in the area under investigation. Levelling has, according to the authors, ly secondary significance, but the influence of meteorological conditions der which the research work is performed is most important.--W. Ayvazoglou.

AN ARTIFICIAL ELECTRIC FIELD WITH 21 PAIRS OF ELECTRODES

(In Russian)

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 216-231.

Contents of the article:

1. General information.
2. Calculation of the potential.
3. Calculation of the equipotential lines.
4. Calculation of the longitudinal component of the electric force.
5. Calculation of the transversal component of the electric force.
6. Calculation of the value and direction of the total electric force.
7. Calculation of the longitudinal component of the magnetic force.
8. Calculation of the transversal component of the magnetic force.
9. Calculation of the value of the total magnetic force.
10. Calculation of the direction of the magnetic force.

In one of his previous articles, "Calculation of an artificial electric field," Petrowsky derived formulas and gave detailed schemes of the calculation of an artificial electric field. The present article examines the calculation of a square field having 21 electrodes on each of the two opposite sides.

The results of these calculations are disposed of in eight tables as follows:

I. A table of potential numbers.

II. A table of relative coordinates of the equipotential lines.

III. A table of longitudinal numbers of force.

IV. A table of transversal numbers of force.

V. A table of longitudinal magnetic numbers.

VI. A table of transversal magnetic numbers.

VII. A table of total magnetic numbers.

VIII. A table containing the angles of inclination of magnetic force to the direction of the lines of the field.

The eight figures given in the article represent:

1. The distribution of the coordinate axes and the numbering of lines and electrodes.

2. Theoretical distribution of equipotential lines in a square field with 21 pairs of electrodes.

3. A graph of longitudinal numbers of force.

4. A graph of transversal numbers of force.

5. A graph of longitudinal magnetic numbers of a square field with 21 pairs of electrodes.

6. A graph of transversal magnetic numbers.

7. A graph of the total magnetic numbers.

8. Theoretical distribution of the magnetic force in a square field with 21 pairs of electrodes.

In the continuation of this article, the author expects to give tables which will make possible the calculation of electrical and magnetic fields not only in the planes of the electrodes but also in space.

These tables will probably appear in the next issue (No. 5, 1929) of he Bulletin of the Institute of Practical Geophysics.--W. Ayvazoglou.

UBER EINIGE GEOELEKRISCHE AUFNAHMEN AM RAMMELSBERG UND IM OBERHARZ

(CONCERNING SOME GEOELECTRIC MEASUREMENTS ON THE RAMMELSBERG AND IN UPPER HARZ)

By Dr. A. Ebert

Metall und Erz, vol. 18, Sept., 1929, pp. 462-467.

The author compares geoelectric methods of prospecting with some thers, especially with the gravimetric, magnetometric, and seismic methods, oticing briefly the advantages and disadvantages of each.

In the second part of the article Ebert describes the experiments ith electric methods of prospecting, performed under the auspices of the ecently created section of the Geological Division of the Prussian Geological nstitution (Preussische Geologische Landesanstalt.)

The well-known ore deposit regions of the Rammelsberg and Upper Harz re chosen for the experiments.

The inductive method has been tried out especially, and the results f investigations are given in a series of maps and diagrams.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

ON THE METHODS OF MEASUREMENT OF SUBSTANCES POSSESSING WEAK RADIOACTIVITY BY MEANS OF α-RAYS

(In Russian)

By V. Baranov

Vestnik du comité géologique, leningrad, vol. 2, No. 7, 1928, pp. 37-41.

The measurement of radio elements in weakly radioactive ores (of the rder of 0.01% U_3O_8 and less) by means of α-rays is sometimes very desirable.

In these measurements a quick method of work, as well as constancy f natural dissipation inside of apparatus, is important. In order to eliminate he defects of electroscopes of usual types used for these measurements, Baranov onstructed an apparatus by which a series of disadvantages could, to a certain egree, be avoided.

A schematical design of the apparatus is given in the article. The pparatus consists of a Wulf's electrometer provided with a cylindrical elec- rode 10 centimeters in length and 5 millimeters in diameter. The electrometer

is turned upside down and is secured to an ionization chamber; the latter has the shape of a cylinder 16 centimeters in diameter and 10 centimeters in heigh The bottom of the chamber can be opened or closed hermetically.

In the center of the bottom of the chamber is soldered a pipe throug which the air is pumped out of the chamber. The constancy of the air current is maintained by means of a special regulator and is controlled by a rheomete The air enters the chamber through to symmetrically placed pipes 20 centimeter long and 1.3 centimeter in diameter; these pipes represent cylindrical condens and are provided with internal electrodes 16 centimeters long and 5 millimeter in diameter insulated by means of ebonite plugs. The electrometer is connecte with a battery of 200 Clark's elements. According to the scheme of this connection shown in a figure, the ionization chamber remains unloaded. This arrangement makes it possible to change the materials to be investigated without the necessity of disconnecting the battery.

Less than two minutes is required for the taking of each reading.

The advantages of the apparatus are as follows:

1. Owing to the fact that the apparatus remains charged and th potential difference at the insulator of the electrometer does not exceed 1 volt during the measurement, the polariza tion of the insulator is not an essential influence.

2. Owing to the uninterrupted flowing of the air current thro the apparatus during the measurement, the influence of the emanation of the material under investigation is greatly reduced.

3. For the same reason as given under (2) the influence of th ions in the air of the chamber is reduced and the change of the natural dissipation during the opening of the chamb is removed to a great degree.

4. The time necessary for taking measurements is reduced considerably, thus the importance of the fluctuations of natural dissipation from outside causes is lessened.

Several tables showing the results of observations made with this apparatus are given.--W. Ayvazoglou.

APPARATUS WITH CLOSED AIR CURRENT FOR THE DETERMINATION OF RADIOACTIVITY OF MINERALOGIC COLLECTIONS

(In Russian)

By S. A. Artsybyshew and V. Pleshanova

Vestnik du comité géologique, Leningrad, vol. 3, No. 8, 1928, pp. 35-39.

After a brief notice on the different defects of apparatus used fo determining the radioactivity of ores in mineral collections, the authors de

ribe a new very simple apparatus constructed by them: A box containing the amples to be investigated is put over a zinc sheet and covered with a square etallic chamber (cover) 55 by 55 by 27 centimeters in size. An electroscope, rovided with a reading microscope, is fixed to the chamber; the electroscope s connected to a commutator in the form of a square wire frame. The upper art of the chamber has an opening through which a propeller is inserted; the ropeller is put in rotation by means of an electromotor. Owing to this rrangement, a strong air current is obtained inside of the chamber, so that ll dead spaced are climinated.

This arrangement also makes it possible to reduce the size of the ommutator and to raise it considerably above the bottom of the chamber; the apacity of the device can be reduced and becomes independent of the size of he samples to be investigated.

The capacity of the apparatus described is constant (with an accuacy of about 5%) and is equal to 20.7 centimeters in case a double wire-frame ommutator is used, and to 13.6 centimeters for a single wire-frame commutator; he size of the commutator is 25 by 25 centimeters.

Four disks, each 5 centimeters in diameter, coated with a thin layer f U_3O_8 were used. The disks and the samples were distributed over the zinc heet arbitrarily.

The distribution of the disks and samples is shown in diagrams, and he data obtained accordingly are given in tables.

The authors proved also that an active sample may be discovered asily by successive covering of the minerals with a piece of heavy cloth.

The results of the experiments are considered to be successful.-- . Ayvazoglou.

GRADUATION OF APPARATUS FOR THE MEASUREMENT OF RADIOACTIVITY

(In Russian)

By A. A. Lomakin

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 151-156.

In the present article Lomakin describes a simple and sufficiently accurate method for comparison of two capacities, one of which is the capacity of an α- electroscope of the usual type.

The method of measurement is given in a scheme.

The graduation of the scale of the apparatus in volts is made, based on the following calculations:

From the formula for the strength of ionization current, $i = \frac{C(V_1 - V_2)}{9.10^{11} t}$ amperes, in which the capacity C is given in centimeters and the voltage drops V_1-V_2 in volts, it is evident that for the calculations of the strength of current not its absolute tension is important, but the change of the tension, $V_1 - V_2$, during the measurement.

The interval of tensions on the scales of very sensitive instrument is small, while a full tension necessary for producing saturated current is more or less large. Therefore, a simple comparison of the reading of the electrometer with the reading of the voltmeter for the full tension V_1 is not rational.

A comparatively small error in the determination of the full tension may become of great value for the comparatively small difference $V_1 - V_2$.

The author eliminates these defects by measuring the tensions V_1 - by a second very sensitive voltmeter. Therefore, the error in the readings of the first voltmeter which shows the tension of the initial point of the apparatus scale remains constant for the whole graduation and does not influence the calculation of the value of the current strength.

The arrangement is shown in a scheme.--W. Ayvazoglou.

DEFINITION OF RADIUM IN RUSSIAN ORTHITES OF DIFFERENT ORIGIN

(In Russian)

By L. N. Bogoyavlensky

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 157-164.

Bogoyavlensky analyzed three patterns of orthites from pegmatite veins of Russian origin but from different ore beds; the determination of the radium has been made by using the emanation method.

Radium has been found in all patterns, but its quantity could not be brought in connection with the content of thorite. As radium in orthite is in a state of radioactive equilibrium with uranium, the orthite has been calculated according to the quantity of uranium.

The author concludes that if the dependency of the content of alkaline metals on radium and uranium is taken into consideration, it can be supposed that the latter is present in orthite as a definite chemical combination and not as a microcosmic ingredient.--W. Ayvazoglou.

ANOMALIES OF THE PENETRATING EARTH RADIATIONS IN THE UKHTA OIL-BEARING REGION

(In Russian)

By L. N. Bogoyavlensky and A. A. Lomakin

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 165-178.

The Ukhta oil-bearing region is situated in the basin of the Pechora iver (North Russia) along the Ukhta River. The oil deposits occupy a vast rea of several tens of square kilometers. In this region the rocks of the evonian era form a great anticlinal fold. The analysis of Ukhta region brine as proved that it contained elements of radium (the highest content being .6 x 10^{-9} grams per liter). Investigations on the radioactivity of the deposits in the region were made in 1927. In addition to radium, mesothorium with 11 products of its dissociation was discovered.

It was found that the brine also contained protoxide combinations of ron which, in combination with the oxygen on the surface of the earth, were iberated in the form of fine ocher of different shades.

Investigations on penetrating earth radiations were made by means f a new electrometer.

The body of the apparatus used had walls 15 millimeters thick and he chamber could be closed hermetically. The volume of the closed chamber as 2,150 cubic centimeters. The authors investigated 44 points. Lead creens of a thickness up to 7.45 centimeters were used. The results of easurements are given in a table which shows that the intensity of radiation aried from 4.37 to 7 ions; that is, the variation reached 72 per cent. A ap of radiometric survey based on the data obtained was prepared (given in figure), and curves of equal intensities showing the values of 5.5, 6.0, .5, and 7 ions are drawn.

In the last part of the article the authors give the results of heir study of radiation. They found that a point far from the accumulation f the radioactive sediments on the surface, the intensity of the radiations hanged very little, and that the calculated coefficient of absorption was qual to 0.5, while the absolute values of the intensities were different. his indicated the insignificance of the quantity of soft radiations due to he radioactive upper strata of the soil.

The difference of absolute values of intensity at each point must, herefore, be assigned to the radiations penetrating from radioactive bodies ituated at certain depths. The coefficient of absorption could not be determined by the authors; it diminished with the increase of the thickness of the ead screen.--W. Ayvazoglou.

I.C.6224.

RADIOACTIVITY OF ASHES OF SOME ROCK OILS

(In Russian)

By L. N. Bogoyavlensky

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 311-314.

Bogoyavlensky describes the results of experiments performed by him to determine the radioactivity of ashes of rock oils. Samples from the Ukhta (North-Russia) oil-bearing region and the Maikop (Caucasus) region were taken. The choice of samples from regions so remote from one another was made because of the great difference of the radioactive phenomena of the brine of these two regions. While the brine from the Ukhta region contains a considerable amount of radium (up to 7.5×10^{-9} grams per liter), that of the Maikop region does not contain radioactive elements at all.

For the determination of the radioactivity of ashes about 200 grams of rock oil were slowly evaporated and the residue burned, weighed and measured in an α-electroscope. The activity of ashes is expressed in units of U_3O_8.

The results of the experiments may be seen from the following table:

ORIGIN OF THE SAMPLES		CONTENTS OF ASHES IN PER CENT	RADIOACTIVITY IN UNITS OF U_3O_8
Ukhta oil-bearing region	No. 1	0.03	0.014
	No. 2	0.098	0.003
Maikop region	No. 3	0.027	0.020

The figures show that the ash activity of oil samples proved to be in an inverse ratio to the contents of ashes. The analysis of ashes performed in order to discover the radioactive emanations showed a complete absence of radium and thorium X.

The author supposes that the activity of ashes is caused by the dissociation products of emanation (polonium) which are produced as a result of the great absorptive capacity of oil with relation to the radioactive emanations.

The experiments which are so far of a preliminary character, show, of course, that the active products are not connected with ashes but with the rock oil itself, as in the first case radium and thorium X would be discovered by the emanation method.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

MÉMOIRE RELATIF À LA PRISE DE LA TEMPERATURE DANS LES SONDAGES

(NOTE CONCERNING THE TAKING OF MEASUREMENTS OF TEMPERATURE IN THE BOREHOLES)

By I. Atanasiu

Annales des mines de Roumanie,
No. 7-12, July-December, 1928, pp. 219-225.

The purpose of the present article is to find out the conditions under which the temperature measurements can be used as a means of determining occlusions produced by cementation.

The author divides the article into the following sections:

1. General considerations on the variation of the temperature in the ground.
2. What can be obtained by taking the measurements of temperature in the boreholes?
3. Conditions which the thermometers must satisfy.
4. Propositions for applying the measurements of temperature in boreholes.

In section one, Atanasiu gives a formula according to which a geothermic degree--that is, the number of meters at which the thermometer must be lowered in order to reach an increase of temperature of 1 degree--can be calculated: $Gr = \frac{h}{t-to}$. Here Gr is the gecthermic degree, h the depth at which the temperature is measured, t the temperature obtained, and to the mean annual temperature of the ground.

In section two the author gives a table of measurements taken at different depths:

Oil Fields	Depth of Borehole	Temperature	Geothermic degree	Remarks
1. Filipesti	886	37.4°	32.6 m.	Without oil.
2. Campina	831	37.4°	30.5 m.	In boring.
3. Moinesti	900	33.7°	36.4 m.	Gas, water.
4. Luncacesti-Zames	480	21.5°	38.4 m.	Surface water.

If the occlusion is not good the water coming from above, which is colder, will cause the lowering of the temperature, and the geothermic degree calculated will accordingly show a higher value than the normal one for the region.

This is plainly shown in the table in the case of Luncacesti-Zames.

Temperature measurements may be useful for the determination of the origin of water appearing in the boreholes. For example, if the occlusion is no longer perfect, it is often difficult to be sure whether the water is originally in the deposit itself or comes from above.

By introducing a thermometer the source of the water can be established with surety, for the temperature will remain equal or be higher in the first case and will drop in the second case.

Section three deals with the construction and protection of thermometers for use measurements at great depths. The author proposes to manufacture the following types:

Type I. With a scale of from 10 to 30° for depths up to 500 meters.

Type II. With a scale of from 25 to 45° for depths from 500 to 1,000 meters.

Type III. With a scale of from 40 to 60° for depths from 1,000 to 1,500 meters.

In the last section Atanasiu proposes that temperature measurements be made obligatory; if taken as often as possible they will furnish valuable material which may serve for general orientation.--W. Arvanoglou.

DETERMINATION OF GEOTHERMAL GRADIENTS ON OIL STRUCTURES

By the American Petroleum Institute

Oil and Gas Journal,
Nov. 14, 1929, pp. 105-106.

This paper is a report of the research division of the American Petroleum Institute on the progress toward determining geothermal gradients in oil fields.

The report concerns the Oklahoma, Texas, Santa Fe, and Long Beach fields.

Oklahoma.-One of the most outstanding facts in connection with earth temperatures in Oklahoma is the apparent agreement of the dip of the isothermal surfaces and the formations.

The reciprocal gradients vary widely from area to area, but show small variations within the same area. The lowest gradient found was 1° F.

n 149 feet (Healdton); the highest, 1° F. in 36½ feet (Glenn Pool).

Data collected in two fields, Haverhill, Kans., and Glenn Pool, kla., indicate that the temperatures are higher at corresponding depths in ells located in the producing area than in wells located outside the produc- ng area.

Texas.-Temperature measurements were obtained from wells in all arts of the State. A complete report on the results of the work has been ubmitted to the American Petroleum Institute. The relationship between the ormal rate of increase of temperature and the structure is especially note- orthy in salt domes and in anticlinal structures carrying much underground ater.

Temperature measurements obtained in salt domes were especially nteresting. The following results were obtained in the Humble Salt Dome, arris County:

1. At equal depths temperatures are higher on the top of the dome than on the flanks.

2. Rate of increase in the temperature with depth is relatively greater on top of the dome than on the flank.

3. The difference in temperature at the same depth and the greater temperature gradient on top of the dome are found not only near the salt but also above the salt (at depths) of 100 and 250 feet).

4. Drill holes on top of the salt domes have approximately the same temperatures at equal depths.

Santa Fe Springs Field.-Fourteen wells were measured, bringing the otal number tested to 33. The following conclusions were drawn from the omputed data:

1. Depth temperature relations are irregular as compared with other fields;

2. Shallow temperatures vary within rather wide limits. Temperatures at a depth of 100 feet range from 65.9 to 74.9° F.

3. The elevations at which a temperature of 100° F. occurs define an irregular isothermal surface.

4. Reciprocal gradients computed over the depth interval 100 to 2,000 feet, vary from 47.5 to 56.6 feet per degree.

5. Reciprocal gradients recomputed over the same depth interval after eliminating certain abnormal temperatures, show a less pronounced irregularity.

6. The lack of a satisfactory relation between geothermal conditions and structure in this field may be attributed to the following three factors:

   a. The variation of the gradients within the narrow limits of only a few feet per degree of temperature;

   b. The unusual conditions of development and production involving the very close spacing of wells and the flow of large quantities of gas and oil under high pressure; and

   c. Natural conditions of ground-water circulation causing the establishment of abnormal shallow temperatures.

Long Beach Field.-Nineteen wells were measured in this field, making a total of 43 completed. The total variation of depth to a 100° isothermal surface is about 200 feet and of reciprocal gradients about 8 feet per degree. The mean isothermal depth is 1,554 feet and the mean reciprocal gradient about 53 feet per degree Fahrenheit.--W. Ayvazoglou.

TEMPERATURE GRADIENT IN THE PECHELBRONN OIL-BEARING REGION, LOWER ALSACE:

ITS DETERMINATION AND RELATION TO OIL RESERVES.

By I. O. Haas and C. R. Hoffmann

Bulletin of the American Association of Petroleum Geologists, vol. 13, No. 10, October, 1929, pp. 1257-1275.

The authors summarize their experience in making temperature measurements in oil wells and consider whether it is possible to ascertain the existence of petroleum on the basis of a smaller or a larger temperature gradient.

The article is divided into the following paragraphs:

1. Description and discussion of thermometers used.
2. Possible sources of error in temperature measurements.
3. Carrying out of temperature measurements.
4. Calculation of temperature gradient.
5. Criticism of results obtained.
6. Application of results obtained.
7. Attempt at an explanation of temperature variations.

In the abstract of the article given by the authors they say:

"Numerous temperature measurements have been made during the last 10 years in the Pechelbronn oil-bearing region, to aid in the search for petroleum deposits.

However, the results of the study of approximately 500 measurements clearly show that the isogeotherms are influenced primarily by the tectonic structure of the Rhine Valley graben. They show a nearly regular rise from the edges to the central part of the graben; also not uncommonly they approach one another. Such increase of temperature is especially marked in the fault zones.

Seemingly the isotherms are not influenced by larger or smaller oil accumulations; therefore, the presence of oil can not be looked upon as the cause of the relatively elevated temperature.

It is perhaps possible to explain the rise of temperature toward the central part of the graben by a gradual change in the nature of deposits. Coarse-grained sandy beds of the graben edges are gradually replaced toward the center by increasingly finer sands, and finally by finely laminated marls. It is possible that these finest deposits act as a sort of protective cover against the loss of heat. This suggestion would also explain the increase of temperature and the accumulation of heat along the faults as it is possible to suppose a stronger increase of temperature in the direction of the dislocation in the strata. This suggestion is strengthened by the fact that the especially high horsts are characterized by temperature maxima on the isothermal map."

A map of the Northern Pechelbronn oil fields showing the temperature curves at a depth of 400 meters and their relation to productive oil zones, as well as three cross sections of the oil fields showing underground temperature curves, are given.

A list of publications on temperature measurements is attached.--A. Ayvazoglou.

LA TEMPÉRATURE DES EAUX PROFONDES DE LA RÉGION PARISIENNE

(THE TEMPERATURE OF DEEP WATERS IN THE REGION OF PARIS)

By P. Lemoine and R. Nassans

Bulletin du muséum national d'histoire naturelle, series 2, vol. 1, No. 4, May, 1929, pp. 264-280.

In this article the authors sum up a series of data obtained on thermometrical measurements of deep waters in wells bored in the region of Paris. They consider these data to be of interest, notwithstanding the lack of certainty that the temperatures taken are of sufficient correctness.

After a brief description of the process by which the geothermic degree (Dg) should be calculated and the influence of the possible errors on its value established, the authors give some data concerning the varieties of the geothermic degree in different places, as determined by the following scientists:

Gensanne, who made experiments in 1740 near Belfort, found, according to Becquerel:

At a depth of 101 m. - - - - 12.5°
Do. 206 m. - - - - 13.1° Dg (101-206) = 17.5 m.
Do. 308 m. - - - - 19° Dg (206-308) = 17.6 m.
Do. 433 m. - - - - 22.7° Dg (308-433) = 33.8 m.

De Saussure (1785), who took measurements in Switzerland at wells bored in searching for rock salt, established these measurements:

At a depth of 108 m. - - - - 14.4°
Do. 183 m. - - - - 15.6°
Do. 220 m. - - - - 17.4°

Corder calculated the geothermic degrees (Dg) given for the following places:

Cormeaux - - - - - - - - - - Dg = 36 m.
Littry - - - - - - - - - - - Dg = 19 m.
Decize - - - - - - - - - - - Dg = 15 m.

By comparing a series of data taken in the wells in Paris and its vicinity the authors found the mean value of the geothermic degree for the basin of Paris to be 34 meters.

Great anomalies were observed in Pressagny-l'Orgueilleux. The temperatures of waters at a depth of 70 meters were found to be 17°, although their normal temperature should be about 13°.

The authors note especially that, by assuming one geothermic degree to be equal to 34 meters, the waters of a temperature of 17° should be at a depth of about 204 meters, but none of the wells situated in the region to the northwest of Pressagny was so deep as that.

Whether this anomaly can be explained by the quick rising of deep waters flowing from the region of Paris to Pressagny remains unsolved, and the conclusion of the authors that the waters in Pressagny are supplied from south and east seems to be the most probable one.

Anomalies observed in several other wells were less important.

In several places waters of a temperature lower than the normal one have been observed. The authors, who called these waters "hypothermal" water could not find any explanation for this hypothermality.

A long list of authors giving the data for the temperatures at different places is added to the article.--W. Ayvazoglou.

7. UNCLASSIFIED METHODS

LES METHODES GEOPHYSIQUES DE PROSPECTION

(GEOPHYSICAL METHODS OF PROSPECTING)

By Georges-Albert Boutry

La revue pétrolifière, Paris,
No. 325, June 15, 1929, pp. 821-825.

In this introductory article Boutry examines the question of geophysical methods of prospecting, especially with regard to prospecting for oil.

A brief discussion of the following subjects is included:

1. Hypotheses on the origin of oil.
2. Increasing difficulties for prospecting oil.
3. Oil-bearing regions of the world.
4. Principal favorable structures of the terrane; and
5. Geological prospecting and its insufficiency.

After giving a general outline of the principles of the methods and their application the author concludes:

"I will try to show that, although the efficiency of geophysical methods of investigation has often been discredited or, on the contrary, exaggerated, it remains true that geophysical prospecting has high value and power and that the use of these methods will become in the very near future absolutely necessary for all kinds of prospecting by which a success is to be obtained."

This introductory article is followed by a series of articles, the purpose of which is to show that the problems for the research of salt domes, faults of monocline structure, anticlines, etc., can be solved by geophysical methods; the possible degree of the solution is examined.

The whole work is arranged according to the following classification:

I. Examination of gravity anomalies: pendular method, torsion balance method.

II. Examination of magnetic anomalies.

III. Examination of electrical anomalies by means of direct current and alternating current.

IV. Examination of elastic anomalies; study of the velocity of propagation of shocks; measurement by sound; measurement by ultrasound.

V. Anomalies of geothermal gradient. Propagation of radiations of short waves in the rocks. Radioactivity in oil areas.

All the articles are provided with many figures and diagrams and a long list of literature is given.--W. Ayvazoglou.

GEOPHYSIKALISCHE ZUSAMMENHÄNGE ZWISCHEN OSTALPEN UND BÖMISCHER MASSE

(GEOPHYSICAL RELATION BETWEEN THE EAST ALPS AND THE BOHEMIAN MASSES)

By Robert Schwinner

Gerlands Beitrage zur Geophysik,
Band 23, Heft 1, 1929, pp. 35-92.

Geologic-petrographic considerations lead to the theory that an old mountain-system (trending from north to south) is hidden under the Calcareous Alps (striking from east to west) and makes a connection between the Bohemian mass and the Central Alps. The examination of the measurements of gravity gave in the first place the startling fact that the idea furnished from the doctrine of isostacy (particularly in the version of Airy) of the deeper part of the crust of the earth must be essentially modified with regard to the Alps. That the 50-kilometer thick flakes of the crust consisting of gneiss (Sial) are dipping more or less, according to the lead of the mountain formation in the heavy basis magma (Sima) is most sufficient to explain the observed anomalies of gravity; the high gradients demand flatter disposed disturbing masses, and these may be suggested, according to geological and geophysical data, as branches of the subjacent heavy "Sima" rising up nearly to the surface through the fissures between the blocks of "Sial."

Such fissures correspond to the principal dislocations of the mountain ranges of this age (border of the Alps, the zone of graywacke of Upper Styria). But even the corresponding structure and distribution of masses of the old mountain chains denuded at the surface and entirely masked by younger covering mountains are preserved in the substratum.

The crossing of the trend lines of the two mountain systems of different age, which can be read in the isograms, confirms the geologic thesis mentioned at the top. Difference in material involves different elastic reaction. Therefore, at earthquakes which are frequent and known on account of their paradoxial extension, these fissures, and indeed those lines which are geologically postulated and known by the disturbance of gravity, can lead, as leading plains of "conducted waves" (Uller), the seismic energy as "transversal quakes" under the Calcareous Alps to the Bohemian mountain mass; or, on the other hand, can stop their spreading by acting as "seismic bars" in the strike of the Alps.--Author's abstract.

GEOPHYSICS

By G. Angenheister

Terrestrial Magnetism,
vol. 34, No. 1, March, 1929, p. 62.

H. D. Harradon gives a brief review on the first part of the twenty-
th volume of Wein and Harms, Handbuch der Experimentalphysik, which bears
general title of "Geophysik." The authorship of this work has been shared
six prominent specialists working under the general editorship of G.
enheister.

"The work is divided into seven main sections. In the opening section, A. Defant gives a general discussion of the physics of the atmosphere, considered under the two headings of Statics and Dynamics. The two following sections on tidal vibrations of the atmosphere and atmospheric optics are by J. Bartels and W. Milch, respectively. The fourth section contains a general discussion of atmospheric electricity by H. Benndorf. Next follows a treatment of northern lights by L. Vegard; he describes the auroral phenomena with reference to form and altitude, relationship with terrestrial magnetism and sunspots, the various theories regarding polar lights and the physical investigations connected therewith, the spectrum of the aurora, and the conditions of the upper layer of the atmosphere, and concludes with an account of an experimental test of his own hypothesis. K. Büttner contributes a section on the penetrating radiation. G. Angenheister and J. Bartels conclude the volume with an essay on the earth's magnetic field, treating the subject under the following headings: Instruments and methods of measurements; the permanent field and secular variation; periodical variations and magnetic activity; magnetic disturbances. The volume is provided with a convenient subject and author index."

The German title of the book is as follows:

Angenheister, G. - Geophysik. I-Teil, unter der Redaktion von G.
enheister, J. Bartels, H. Benndorf, K. Büttner, A. Defant, W. Milch, L.
gard. Wien-Harms, Handbuch der Experimentalphysik, Band 25, I Teil, Leipzig.
demische Verlagsgesellschaft m.b.H., 1928 (XIV + 699 mit 185 Abbildungen).--
Ayvazaglou.

POSSIBILITIES FOR GEOPHYSICAL PROSPECTING OF PLACERS

(In Russian)

By K. P. Kosin

Gorny Journal, Moscow, No. 4, April, 1929, pp. 348-355.

So far very little attention has been paid to the possibility of
physical prospecting of placers.

Referring to two articles which appeared in the Engineering and
ning Journal Press (A. Gibson, Magnetometric Determinations Applied to

Placer Mining," vol. 144, No. 25, 1922, and K. Laylander, Magnetometric Surveying as an Aid in Exploring Placer Ground, vol. 121, No. 8, 1926), Kosin draws the conclusion, based on the results of investigations obtained by Gibson and Laylander, that geophysical methods, especially the magnetometric, can and should be used in certain cases. Of course some favorable conditions are necessary. Therefore, geophysical prospecting must be accompanied by drilling and digging, as the latter work may serve not only for the verification of the results but also as material for the interpretation of them.

According to the author, successful results may be obtained--for example, when a placer deposit already contains 0.5 per cent of magnetite.

No geophysical prospecting of placers has been tried so far in the U.S.S.R.

In the last part of the article Kosin discusses theoretically the possibility of using electrical and especially seismic methods for prospecting placer deposits. He concludes that in order to enlarge the sphere of geophysical prospecting for placer deposits a detailed examination of technical possibilities is desirable.--W. Ayvazaglou.

URGES LABORATORY DEEP IN THE EARTH

By Prof. H. Shapley

The New York Times, Nov. 27, 1929, p. 14.

This article is an address delivered by Prof. Harlow Shapley, director of the Harvard Observatory, before the American Geographical Society in New York.

Speaking on what he termed "the third dimension in geography," Shapley asserted that failure to study the interior of the earth beyond a small depth close to the surface constitutes a very serious hiatus in scientific inquiry. For example, by boring deep into the earth it might prove possible to tap the earth's internal source of heat for utilitarian purposes; the knowledge of the mineral wealth of the region bored would be important besides. Therefore, Shapley urged the establishment of a series of laboratories, called by him "Plutonic laboratories," at various depths along a vertical shaft. The installation of such laboratories, although a scientific adventure of great difficulty and expense, would mark an important epoch in man's attempt to understand the earth.

These laboratories may contribute to the knowledge of many important fields in geophysics and astronomy, such as: Investigations of the irregularities in the length of the day and the pulsation of the earth's crust; the thermogradient of the earth and its bearing on the origin of the earth and its source of heat; the nature of the radio activity in the rocks and its variation with depth; studies of earthquake waves; experiments on relativity--for example the problem of the "ether-drag;" and the problem of the floating of the continents--a test of phases of the Taylor-Wegener hypothesis which holds that America is drifting away from the African and Eurasian continents.

Many smaller scientific problems, such as experiments on living rganisms in situations free from cosmic radiation, study of gravity variation nd the lunar tides in the body of the earth, as well as the dating of the ice ges and the interglacial periods could be studied also.

Part of Prof. Shapley's address was devoted to a discussion of the arth-moon system.

Pointing out that both theory and observation indicate that the moon as been gradually receding, this recession being about 7 feet per century, rof. Shapley declared: "The future of the earth-moon pair seems to be that .e day will grow gradually longer, and also the month, until they are the ame, at about 47 of our present days. This will require, according to Jeffreys, one 50,000,000,000 years. After this, the moon will again approach the earth radually until it is broken up by tidal disruption just before it gets to the arth's surface. This remote catastrophe may result in a ring of fragments irculating around the earth much like the ring around Saturn."--W. Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN THE TWO FIRST NUMBERS OF THE "BOLETIN DE LA ASOCIACION GEOFISICA DE MEXICO."

Vol. 1, Nos. 1 and 2, July and August, 1929, pp. 5-8, 33-52.

The bulletin issued recently by the Geophysical Association in Mexico, he two first numbers of which (July and August, 1929) have just appeared, con- ains several articles dealing with geophysics and their application in pros- ecting for minerals and oil.

The following articles may be mentioned:

1. Importance of Studying Geophysics (Importancia del estudio de la geofisica) (No. 1), by Eng. R. Monges L. The author gives a brief description of the development and study of geophysical methods of prospecting in different countries.

2. Geophysics as Applied to Minerals and Oil (La Geofisica aplicada a la minera y al petroleo) (No. 2), By R. Monges L. This is a brief description of different geophysical methods of prospecting (gravimetric, seismic, electrical, magnetic, radioactive, acoustical, and thermic). Prefer- ences for application of one or another method in the search for minerals and oil are discussed, and the connection of geophysics with geology is mentioned.

3. Physical Principles of the Gravimetric Method of Prospecting, by P. Nikiforov (see Geophys. Abs. 2). This is a transla- tion of Nikiforov's article from Russian into Spanish made by Prof. Eng. Juan Korzujin. (The article is to be con- tinued.)

4. Application of Geophysical Methods of Prospecting in Practice (El Empleo de metodos geofisicos en la practice), by Eng. Kurt Ritzau.

In the part of the article given in No. 2 of the Boletin, Ritzau discusses questions concerning the objects of application of geophysics and the fundamental principles of each method of geophysical prospecting. The article is to be continued.

A list of members of the recently created Geophysical Association of Mexico is given in issue No. 2 of the bulletin.--W. Ayvazoglou.

SCIENTIFIC IMPORTANCE OF APPLIED GEOPHYSICS

(In Russian)

By V. A. Gorsky

Transactions of the Fourth Meeting of Russian Academic Organizations Abroad, 1929, pp. 85-91.

In the article Gorsky expresses his opinion on the desirability of unifying the methods used for studying the earth's crust with the new means offered by geophysics. Taking into consideration that (1) the natural constant static fields of force and conditions of the geoid as a whole (gravitation, magnetism, electricity, heat and radioactivity) and (2) the artificial, changeable dynamic fields of force (electromagnetic and elastic), are known theoretically under the condition that the geoid is a homogeneous body, determination of the geological reasons for the deformations of the normal fields caused by the heterogeneity of the earth's crust can be made by measuring at different points of the surface of the earth the values characterizing these fields.

After briefly stating how these geophysical means may be applied, Gorsky concludes that with the aid of systematic geophysical researches on a large scale, the structure of the geoid, laws of the formations, and the complicated relations of different factors in the process of the movement and life of the earth's crust can be studied. The author proposes to unify this study into a special science--"lithospherology."

Being closely connected with the problems and sphere of work of geophysics, geology, and geochemistry, lithospherology may unite all these separate sciences into a definite and harmonious systematic study of the complicated relations existing in the earth's crust.--W. Ayvazoglou.

8. GEOLOGY

DECOUVERTE DE PETROLE DANS LA REGION DE L'OURAL

(DISCOVERY OF OIL IN THE REGION OF THE URAL)

Editorial Note

La revue petrolifiere, Paris,
Nos. 324 and 325, 1929, pp. 779 and 961.

The discovery of extremely vast oil deposits in the region of the Ural near Tchussovskie Gorodki, about 50 kilometers from the city of Perm, is

ported. The importance of this discovery is very great not only on account the richness of oil (estimated by Prof. Strijev at about 300 millions of ns) but also because of its geographical location in the center of a highly veloped industrial, especially metallurgical, region. The ability to ansport the oil to all places of the U.S.S.R. by using the big rivers hussovaya, Kama, and Volga is a very favorable feature besides. Two and e-half millions of roubles have already been appropriated by the government r the accomplishment of detailed investigations.

The data obtained by the analyses of different samples of oil dis-vered recently are as follows:

	Per cent
Gasoline - - - - -	20.
Kerosene - - - - -	12.-.15
Oil-gas - - - - - -	12 - 20

The remainder is bituminous residue.

The gasoline is rich in aromatic hydrocarbons, the characteristic roperties of which are on initial boiling point of 66° and of final point 175°; 31 per cent evaporates at 100° and 93 per cent at 160°.--W. Ayvazoglou.

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DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 9.

Compiled by Frederick W. Lee [2]

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1. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U.S. Bureau of Mines Information Circular 6233."

1. GRAVITATIONAL METHODS

DIE REGISTRIERUNG DER SCHWINGUNGEN EINES SCHWERKRAFTPENDELS MITTELS HOCHFREQUENTER ELEKTRISCHER SCHWINGUNGEN UND IHRE RÜCKWIRKUNG AUF DAS PENDEL

(REGISTRATION OF OSCILLATIONS OF A FORCE OF GRAVITY PENDULUM BY MEANS OF HIGH-FREQUENCY ELECTRIC OSCILLATIONS AND THEIR REACTION UPON THE PENDULUM)

By H. Schmehl

Zeitschrift fuer Geophysik, vol. 5, No. 2, 1929, pp. 53-58.

In 1928 the author made observations of the reaction of pendulum registration to high-frequency electrical oscillations. In order to obtain more precise data Schmehl continued these observations in 1929 after some improvements of the instruments were made.

The effect of the new registration arrangement, which works by means of high-frequency electric oscillations as well as by capacity constants, is examined.

The gilt, nickel-steel, half-second pendulum, constructed by M. Fechner is described and a table showing the observations made with this pendulum is given.

After examination of the results of the pendulum observations the author concludes that the registration of pendulums by means of high-frequency currents may be applied with good results in making relative measurements of the forces of gravity.—W. Ayvazoglou.

DIE REGISTRIERUNG VON PENDELSCHWINGUNGEN MITTELS KAPAZITIVER KONSTANTE

(REGISTRATION OF PENDULUM OSCILLATIONS BY MEANS OF CAPACITY CONSTANTS)

By H. Mahnkopff

Zeitschrift fuer Geophysik, vol. 5, No. 2, 1929, pp. 49-53.

The article deals with experiments performed partly by P. Lejay in Zikawei (China) and Paris and partly at the Geodetic Institute in Potsdam.

Experiments have proved that the electric contacts of a precision pendulum-clock can be replaced by comparatively simple devices working by means of high-frequency short-wave oscillations, and that the oscillations of the

orce of gravity pendulums can be registered with a high accuracy with the aid capacity coupling.--Author's Abstract translated by W. Ayvazoglou.

INTERRELATION BETWEEN THE LOCAL GRAVITY ANOMALIES AND THE DERIVATIVES OF THE POTENTIAL

By B. Numerov

Zeitschrift fuer Geophysik, vol. 5, No. 2, 1929, pp. 58-62.

Numerov derives formulas by which the potential and its derivatives ay be computed if the distribution of gravity over a plane, presented by a art of the earth's surface, is known. Thus, without taking into consideration he remotest zones and without extending the integration over the whole globe, he differences between the derivatives of the potential for contiguous points ay be found.

Of practical value are the first derivatives of the potential of disrbing masses, which show the deflection of the plumb line U_x and U_y along the axis and the y axis.

The possibility of computing the deflection of the plumb line on the asis of gravity anomalies may be of great practical importance, especially in emote regions where the topographical surveys are to be based on astronomical bservations instead of triangulation.--W. Ayvazoglou.

UEBER DEN GRÖSSTEN MÖGLICHEN SCHWERE-UNTERSCHIED

(ON THE HIGHEST POSSIBLE DIFFERENCE OF THE FORCE OF GRAVITY)

By Karl Jung

Zeitschrift fuer Geophysik, vol. 5, No. 2, 1929, pp. 65-72.

The author shows how to estimate the value of the highest possible ifference of the force of gravity between two stations caused by the density ifferences in the subsoil. The estimation is considered to be adequate for ll cases.

The results are given in the form of curves suitable for use in ractice.

The author concludes the article by a brief discussion of the results. e says: "Examination of the curves shows us that $\frac{\triangle g}{\triangle \delta}$ increases with the increase of a (half distance between the stations) from 0 to the highest value. his highest value is equal to about 40 t (t in kilometers). Of course this stimation is valid for great distances between the stations only. Thus, where = t, about three-fourths of the highest value $\frac{\triangle g}{\triangle \delta} = 40\ t$ is reaches; where = 1/10 t, about one-fifth; where a = 1/100 t, about one-twentieth; and where = 1/1000 t, about one-hundredth.

Differences of the force of gravity caused by density differences can not be higher, and if observed may result from the inaccuracy of measurements or corrections, provided that no assumptions on the distribution of densities in the subsoil which differ greatly from those known so far are made."--W. Ayvazoglou.

ERHÖHUNG DER BEOBACHTUNGSGENAUIGKEIT BEI RELATIVEN PENDELMESSUNGEN

(INCREASE OF ACCURACY OF OBSERVATIONS WITH RELATIVE PENDULUM MEASUREMENTS)

By O. Meissner and H. Martin

Zeitschrift fuer Geophysik, vol. 5, No. 3-4, 1929, pp. 145-151.

Two simple photographic methods of registration for determining differences in time of oscillation of various pendulums are given: (1) The registration of pendulum oscillation, and (2) the photographic coincidence proceeding.

The first method is described by O. Meissner, who is of the opinion that the present time accuracy of gravity measurements with relative pendulum measurements, which amounts to about 1×10^{-3} cm. sec.$^{-2}$, is in many cases not sufficient for geophysical exploration work and therefore must be increased up to 2×10^{-4} cm. sec.$^{-2}$. O. Meissner describes his method, which is based on the improvement of the method of observation of differences in the time of oscillation.

The experimental arrangement, as well as the interpretation of the data obtained, is explained.

The second method, described by H. Martin, consists of improving the accuracy of observation of coincidences. The arrangement of the experiment explaining this method is given in a schematical design, and a table of a series of measurements shows that the desired accuracy can really be obtained.--W. Ayvazoglou.

BASES CIENTIFICAS Y PRACTICAS DEL METODO GRAVIMETRICO

(SCIENTIFIC AND PRACTICAL BASES OF THE GRAVIMETRIC METHOD)

By W. Olhovitch

For his thesis Olhovitch was granted the diploma of a Mexican petroleum engineer by the National University of Mexico, in November, 1929. According to the statement of Juan Korzujin, Professor of the Mexican National University, the pamphlet is of real interest. He writes: "Geophysicists will agree that until now there has not existed a full description of gravitational surveying, although the literature on this subject is quite extensive and the theory, as well as the practical use of the gravitational balance, must be considered to be widespread. There are many booklets and articles containing full

nformation on the torsion balance, but it is noticeable that until the present here has not been even a fixed denomination of the coefficients.

"It is also to be mentioned that many authors of short treaties on he torsion balance too often omit the mathematical development of their formlas, which makes a thorough study of the theory of the torsion balance unecessarily difficult.

"The main task of Olhovitch's work consists of issuing a concise sumary and unification of different systems by which the gravitational balance is xplained and of deriving formulas by which the understanding can be facilitated. From my practice in teaching geophysics I know how much time may be ost by a student in deriving such formulas, as for instance formula 6 (p. 9) r Figure 4 (p. 23) of L. Oertling's booklet, without speaking of the far more cientific works of P. Nikiforov and many others. Pure mathematical problems hould not be left unsolved in a book dealing with geophysics. In Olhovitch's ook all these unnecessary difficulties are eliminated, thus it certainly will e much appreciated by all young student geophysicists. The examining body of rofessors decided to have the book published by the National University of exico. The book is written in Spanish, but its publication in English might e of great value."--Juan Korzujin.

CONTRIBUTION TO THE QUESTION OF THE DISPLACEMENT OF THE ZERO-POINT OF THE TORSION BALANCE IN A GRAVITY VARIOMETER

(In Russian)

By P. M. Nikiforov, S. K. Ghirin, and D. G. Uspenski

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 268-292.

The authors give some of the results of their experiments carried ut in connection with the displacement of the zero-point of a torsion balance aused by the reaction of the wire to heating and cooling, as well as by the ffect of convection currents on the balance beams. The instruments used for xperiments were the variometers constructed by the Physical Institute in eningrad (Nos. 101 and 103) and the Schweydar-Bamberg instrument No. 87.

Several figures given in the article show the behavior of the beams t different temperatures.

A connection between the displacements of the zero-point and variaions in temperature has been established with certainty by the experiments. t the same time the existence of a great complexity in this dependence has een found.

In the opinion of the authors the following conclusions may be drawn rom the experiments:

1. Temperature fluctuations in the surrounding air strongly affect the position of the zero-point of the torsion balance in a gravity variometer.

2. The displacement of the zero-point of a torsion balance is closely connected with the effect of convection currents on the beam within the protecting casing.

3. The behavior of both beams of a gravity variometer may be different under equal conditions of temperature fluctuations.

4. In case the temperature of the instrument is not steady the position of the zero-point of the beam can not be determined as a function of the temperature only, therefore a correction of the temperature coefficient in a general way is not sufficient.

5. For comparatively large values of the temperature gradient relative to time, of the order of 2° per hour and more, the position of the zero-point is not a function of this gradient only, in some cases one and the same value of the gradient may cause deflections of the beam different in magnitude, as well as in sign.

6. For small values of the temperature gradient relative to time, of the order of 1° per hour and lower, the undulatory portion of the curve disappears, thus a strict connection between the position of the zero-point and the value of the temperature gradient is evident (but not between the position of the zero-point and the temperature itself).

7. The magnitude and the signs of the displacements of the zero-point of a torsion balance depend upon the position of the beam and loads with relation to the walls of the protecting casing--that is, with relation to the ascending and descending convection currents.

8. The displacement of the zero-point depends to a high degree upon the position of the lower load with regard to the bottom and the top of the lower tube of the instrument. The authors connect this phenomenon with the change of directions of convection currents at these points of the tube.

9. The occurrence of convection currents is conditioned by the existence of the temperature gradient in the direction of the radii from the axes of symmetry to the walls of the instrument.

10. Displacements of the beam in the same direction may correspond to horizontal and vertical temperature gradients having different signs, and inversely, deflections of the beams having different signs may correspond to temperature gradients having the same sign.

11. During the heating and cooling of the instrument the sign of the displacement of the beam depends at the same time upon the height of suspension of the lower load and upon the angle between the beam and the plane of symmetry of the protecting casing.

12. The deflection of the zero-point can not be explained by the effect upon the beam of the flow of momentums the origin of which is the increase of particle energy during the rising of the temperature.

13. Study of questions concerning the investigation of convection currents inside of the envelope of the instrument, as well as of how to direct these currents so that their effect upon the displacement of the beam may be a minimal one, is very important.

14. Protecting the instrument against variations of external temperature is important in obtaining accurate readings.

15. The reduction of the effect of convection currents upon the displacement of the zero-point of a torsion balance to the minimum will certainly be possible by placing the balance in a vacuum. This is a problem of technical construction.

16. The results of the authors' experiments point out the importance of working in the field with continual recording of the oscillations of the beam of a gravity variometer.--W. Ayvazoglou.

GRAVIMETRICAL PROSPECTING OF FERRIFEROUS QUARTZITES IN THE DISTRICT OF KRIVOY ROG

(In Russian)

By P. M. Nikiforov, S. K. Ghirin, and D. G. Uspensky

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 315-326.

The authors give the results of the researches made in 1927 in addi-on to those made in 1925 and 1926 and already described in a previous work ee, F. W., Geophysical Abstracts, No. 1. "Gravimetric researches of ferrugi-us quartzites in the region of Krivoy Rog." I. C. 6120, Bureau of Mines, 29, 25 pp.)

For the survey, the whole area was divided into two sections, the rthern and the southern. In order to obtain more detailed results the thors adopted the system of prospecting lines 100 meters apart. Six torsion lances have been used--four constructed by the Physico-Mathematical Institute Leningrad, one Hecker's instrument type 1913, and one Schweydar's type 1926.

The following table shows the comparative efficiency of the different struments.

Comparative Efficiency of Six Torsion Balances

INSTRUMENT	Number of observations	Number of stations	Number of working days	Number observations per day	Number of stations taken per day
Physico-Math. Inst. No. 101	154	116	73	2.11	1.59
Do. No. 102	221	197	77	2.74	2.56
Do. No. 103	210	172	73	2.88	2.36
Do. No. 104	225	201	68	3.31	2.96
Type Hecker (1913)	146	116	74	1.97	1.57
Type Hamberg No. 87	72	62	44	1.64	1.41

New pavilions 1 by 1 by 2 meters in size have been used for protecting the instruments against the change in meteorological conditions.

A geological map based upon the survey is added. A comparison of gravimetrical prospecting with the data obtained by drilling is shown in the corresponding two maps. Although the correctness of the results obtained by gravimetrical prospecting is well proved by the comparison of them with the data obtained by drilling, the authors are of the opinion that a systematical control by drilling is necessary.--W. Ayvazoglou.

ON A RELATION BETWEEN THE DISTRIBUTIONS OF GRAVITATIONAL ANOMALIES AND THE ORIGINS OF EARTHQUAKES IN JAPAN

By Chūji Tsuboi

Proceedings of the Imperial Academy, Tokyo,
vol. 5, No. 8, October, 1929, pp. 326 - 330.

Tsuboi investigates the possible relation between the distributions of the gravitational anomalies and the origins of earthquakes in Japan. An actual comparison of these two distributions has shown a remarkably close correlation existing between them.

Measurements of the intensity of gravity, at not lessthan 122 stations, have been completed over the main part of Japan. For each station the gravitational anomalies $g_0'' - \gamma_c$ were calculated, where g_0'' is the intensity of gravity corrected for the free-air, terrane, and Bouguer effects, and γ_c is the intensity of gravity as calculated by the Helmert formula. The isostatic reductions were not made.

Two maps showing the distribution of the centers of the earthquakes are given. The earthquakes taken into consideration were those which occurred within the last 15 years, amounting to about 1000 in number.

By comparing the two maps, Tsuboi established that the gravitationally anomalous regions were also regions most frequented by earthquakes; that is, that earthquakes occur in gravitationally anomalous regions more frequently than in others.

Tsuboi proposes four alternative explanations: (1) That the gravitational anomaly causes earthquakes, (2) that the earthquakes cause the gravitational anomaly, (3) that gravitational anomaly and occurrence of earthakes are produced by one common cause, (4) (with the least probability) that e gravitational anomalies and earthquakes are entirely independent phenomena d the apparent coincidence of the distributions of them is merely accidental.

He concludes that a decisive choice of any one of these alternatives ould be made after a more complete accumulation of data is obtained.--W. vazoglou.

2. MAGNETIC METHODS

A NEW MICROMAGNETOMETER

By Frank Rieber

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 401-415.

After a brief description of the relation of simpler structures to e magnetic anomalies caused by them and of an approximate estimation of the curacy with which these anomalies can be measured with the instruments now use, Rieber describes a new device by which the degree of accuracy and dendability of magnetic instruments may be increased considerably. The experintal model of the new instrument had shown an apparent accuracy of over 30 mes that of typical field balances. As it was realized that this instrument st first of all maintain the vertical and horizontal component measurements an absolutely vertical and horizontal direction, a heavier form of tripod s been adopted, together with the level bubble tubes of the type employed by e Coast and Geodetic Survey.

These levels can be read to 2 seconds of an arc, or approximately 0005°. The arrangements made for intensifying the sensitivity of the new strument are explained and shown in accompanying figures.

Photographic pictures of the instrument set up for visual tests and r photographic test are given. During the experiments the effects of the ngth and dimensions of the vibrating wire and the arrangement of the magnetic s were given attention, with the result that a few small changes were made d a second model is now under construction.

The author concludes: "Due to the lightness and the strength of the re which constitutes the one moving part, and to other features of construcon, greater dependability as well as greater accuracy may be hoped for."--Ayvazoglou.

I.C.6233.

EIN TRANSPORTABLER ELEKTRISCHER MAGNETOMETER

(A TRANSPORTABLE ELECTRIC MAGNETOMETER)

By W. Uljanin

Terrestrial Magnetism, vol. 34, No. 3, Sept., 1929, pp. 199-207.

An electrical method for determination of the horizontal intensity of the earth's magnetism is described. The magnetometer has been designed by the author and manufactured by the firm of Prof. Dr. Edelmann und Sohn in Munich.

The magnetometer has been carefully examined and proved to be of practical value.

A detailed description of the magnetometer and of the potentiometer is given and a scheme of the system of connection shown.

The method for determining the constant of the magnetometer is explained. In the last section of the article Uljanin gives his experience with different types of Weston cells, as in his opinion, the electrical method of measuring the horizontal component is based on the exact knowledge of the electromotive force of the applied standard cell.--W. Ayvazoglou.

A DEMONSTRATION OF THE REFLECTION OF GEOLOGIC CONDITIONS IN OBSERVED MAGNETIC INTENSITY

By H. R. Aldrich

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 385-400.

The paper presents a diagram of dip-needle readings across the Gogebic iron range and the Keweenawan formations in part of northern Wisconsin. The diagram is studied in connection with the geological map and serves to demonstrate the extent to which such methods may aid in solving geological problems in a covered country.

The author expresses the hope that the appended charts, or magnographs which show how the character of the country rock and its changes, structural strike and dip and their changes, depth of burial and its variation, contact metamorphic effects, normal faults and thrusts, joint control of buried topography and other essential geologic features and phenomena, reflect themselves in magnetic observations. He believes that the charts will be of service in promoting magnetic methods and will inspire confidence in the probability that results obtained with a physical instrument may be interpreted with some degree of accuracy.--W. Ayvazoglou.

ZUR ANISOTROPIE DER PHYSIKALISCHEN PARAMETER VON GESTEINEN, SPEZIELL DER MAGNETISCHEN SUSZEPTIBILITÄT

(CONCERNING THE ANISOTROPY OF PHYSICAL PARAMETERS OF MINERALS, ESPECIALLY OF THE MAGNETIC SUSCEPTIBILITY)

By J. Koenigsberger

Zeitschrift fuer Geophysik, vol. 5, No. 2, 1929, pp. 62 - 64.

In the definition of the magnetic susceptibility, according to the thods suitable for field measurements, the crystalline slates have shown a stinct magnetic anisotropy similar to their thermic, electrical, and elastic isotropy.

The anisotropy can also be explained without the acceptance of aniso- opic bearers of magnetic induction, as for example in the case of pyrrhotite, a certain arrangement of isotropic or disarranged anisotropic grains of inerals in rocks.--Author's abstract translated by W. Ayvazoglou.

A THEORY OF THE PERMANENT MAGNETIC FIELDS OF THE SUN AND EARTH

By Ross Gunn

The Physical Review, vol. 34, No. 2, July, 1929, pp. 335-344.

The motion of ions, executing short free paths under the influence of rmal agitation in an inhomogeneous magnetic field, in crossed magnetic and avitational fields or in crossed magnetic and electric fields are shown to oduce drift currents. The ion drifts are found to be opposite in direction the drifts produced in analogous cases of long free path. Under the condi- on of radial symmetry and a closed circuit the magnetic gradient gives rise circular currents which flow in such a direction that magnetic regeneration kes place. Regeneration is limited by demagnetizing currents arising from e thermal motions of the ions interacting with the resultant magnetic field d an internal electric or gravitational field.

The magnetic moments of the sun and earth are calculated from data ich are approximately known and the correct magnitudes obtained.

The permanent fields arise from the thermal energy of the body and uld be maintained if the bodies ceased their rotation. The asymmetry of the rth's magnetic field indicates that the hemisphere embraced by the Pacific ean is at a higher mean internal temperature than the rest of the earth.-- thor's abstract.

INDUCTION-COEFFICIENTS FOR MAGNETOMETER-MAGNETS

By H. E. McComb

Terrestrial Magnetism, vol. 34, No. 3, Sept. 1929, pp. 241-247.

A special apparatus was designed for the investigation of induction-

coefficients of magnetometer-magnets by Lamont's method. Maximum accuracy is obtained when the vertical distance between magnets is equal to one-half the horizontal distance. Tests were made over wide ranges of horizontal and vertical distances.--Author's abstract.

PROCEEDINGS OF THE MAGNETIC SECTION OF THE INSTITUTE OF PRACTICAL GEOPHYSICS IN 1927

(In Russian)

By I. M. Bahurin

Bulletin of the Institute of Practical Geophysics, No. 4, 1928, pp. 181 - 196.

Magnetometric investigations were made in 1927 for the purpose of testing and comparing the deflection magnetometer constructed by the Institute of Practical Geophysics with the Tiberg-Thalen's magnetometer calibrated in the Institute of Practical Geophysics; the results obtained by observations with the deflection with the deflection magnetometer were also compared with those obtained by Schmidt's balance.

The work was carried on in the Zaporojsky and Pervomaisky districts. A map of the magnetometric survey and four profiles, showing the results of investigations in the form of the equipotential lines of the vertical component of anomalies is given. At some point of the investigated anomalies the vertical intensity Z reached a value equal to 1.340. About 1,000 observations were made. More exact results were obtained after the calibration of Tiberg-Thalen's apparatus in the laboratory of the Institute of Practical Geophysics.

Comparison of the apparatus previously mentioned showed a constant and more or less considerable difference between the data obtained by them. The reasons are not established yet.

In working with the deflection magnetometer constructed by the Institute of Practical Geophysics it was possible to define H and Z in about 40 to 50 points per day.--W. Ayvazoglou.

AN ESSAY OF COMPARISON OF THE RESULTS OF MAGNETOMETRIC AND GRAVIMETRIC SURVEYS OF DEPOSITS OF FERRUGINOUS QUARTZITES IN THE DISTRICT OF KRIVOY ROG

(In Russian)

By S. K. Ghirin and A. A. Popov

Bulletin of the Institute of Practical Geophysics, Leningrad, No. 4, 1928, pp. 299-308.

The authors describe the results of the magnetometric method of researches made in the district of Krivoy Rog over the same area previously investigated by the gravimetric method (see Lee, F. W., Geophysical Abstracts

. 1, "Gravimetric researches of ferruginous quartzites in the region of Krivoy g." I.C.6120, Bureau of Mines, 1929, 35 pp.) in order to compare the data obined by the two methods.

Tiberg-Thalen's and Thomson-Thalen's instruments were used. The inruments were calibrated at the magnetic station of the Institute of Practical ophysics in Leningrad.

A map with curves showing variations in intensity of the vertical comnent across the strike of the deposits is given, and a geological map based the data obtained by the gravimetric investigation made over the same area added.

From the comparison of the two maps the authors draw the conclusion at the results of both the surveys are on the whole similar. In both cases e three main strata of ferruginous quartzites were determined.

In comparing the two methods the authors are of the opinion that in arching for iron-ores a preliminary estimation of the deposits should be made the magnetometric survey, after which a more detailed gravimetric investigaon should be carried out. Of course this conclusion concerns to the given se only.--W. Ayvazoglou.

3. SEISMIC METHODS

NEUE ERGEBNISSE DER EISSEISMIK

(NEW RESULTS OBTAINED IN THE SEISMICS OF ICE)

By H. Mothes

Zeitschrift fuer Geophysik, vol. 5, No. 3-4, 1929, pp. 120-145.

In July and August, 1928, artificial seismic waves were produced in ntereisferner (Oetztaler Alps) by explosions and were measured optically by ans of a vertical seismograph at distances of 180 to 600 meters. According the mean figures of a great many single measurements the following values r the velocity of wave propagation have been found: in lingual ice, V_l = 600 m./sec.; in perpetual ice, V_l = 3,140 m./sec.; (V_l is the propagation of ngitudinal waves running directly from the place of explosion to the place of bservation). in lingual ice, V_{ll} = 1,690 m./sec.; in perpetual ice, V_{ll} = 350 m./sec.; (V_{ll} is the propagation of probably transverse waves following e same path).

In 25 cases reflections of longitudinal waves at the lower boundary rface of the ice, which served for the determination of the thickness of the e, could be registered.

The reality of the reflections has been proved by the picture of the avel-time curves, as well as by the indication that the longitudinal reflecon waves are subjected to total reflection. The results were confirmed and

extended during the ice-seismic work in March, 1929, on the Konkordia-Platz (Aletschgletscher).

A great number of pictures, as well as several tables showing the comparative data of the results of measurements, are added.--Author's abstract translated by W. Ayvazoglou.

SEISMISCHE BEOBACHTUNGEN VON STEINBRUCHSPRENGUNGEN

(SEISMIC OBSERVATIONS CONCERNING BLASTING IN QUARRIES)

By E. Wiechert

Zeitschrift fuer Geophysik, vol. 5, No. 3-4, 1929, pp. 159-162.

To determine the travel-time curves, a complete list of the literature available from 1925 to 1929 on seismic work concerning blasting in quarries has been collected by Wiechert. The purpose of the work consisted of studying the uppermost layer of the earth's crust. Wiechert started this work and after his death the work was completed under the direction of B. Brockamp. A table showing the data for these travel-time curves, called "Göttinger Laufzeitkurven," is given in the article. Two travel-time curves are drawn: P_2 for the longitudinal waves propagated through the primitive rocks (Grundgebirge"), and P_3 for waves having greater velocity and moving through the layers situated below the "Grundgebirge."

A brief description of the formation of the underground at the places of blasting and observation is added.--W. Ayvazoglou.

BEMERKUNGEN ZU DEN BEOBACHTUNGEN BEI STEINBRUCHSPRENGUNGEN

(REMARKS CONCERNING THE OBSERVATIONS MADE ON BLASTING IN QUARRIES)

By B. Brockamp and K. Wölcken

Zeitschrift fuer Geophysik, vol. 5, No. 3-4, 1929, pp. 163-171.

This is an article written in connection with the previous research work on blasting in quarries (see Wiechert's article preceding). After mentioning the apparatus used for observations, the authors examine the velocity of the longitudinal waves at different depths. The results of these observations are given in a table. The mean value for the velocity V_2 of the waves P_2 moving through the "Grundgebirge" is calculated to be: $V_2 = 5.90$ km./sec. Another table shows the time-curves for P_3, as well as differences of $P_2 - P_3$. The mean value of the velocity V_3 of the waves P_3 is: $V_3 = 6.72$ km./sec.

The determination of the depth h of several layers through which the waves are moving is given in the last part of the article. The depth h is calculated according to two formulas:

(1) $h = \frac{\triangle^s}{2}\sqrt{\frac{V_2-V_1}{V_2}}$ . . . . . Under the condition that the rays move upwards vertically.

2) $h = \frac{\triangle s}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}}$ . . . . . Under the condition of oblique rising of the rays.

Here $\triangle s$ means the distance at which the time-curves intersect, nd V_1, V_2 (or respectively V_2, V_3) the velocities in the corresponding layers. -W. Ayvazoglou.

ADAPTATION OF ELASTIC-WAVE EXPLORATION TO UNCONSOLIDATED STRUCTURES

By Frank Rieber

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 654-667.

The article deals with the development of new types of apparatus and number of extensions of the earlier mathematical methods of treating the results by which the elastic-wave methods may be used in a wide variety of locations and in relatively unconsolidated sedimentary materials to give a very accurate picture of structural conditions.

Examination is made of the development of the chief requirements of apparatus, such as the most sensitive means for recording vibrations and the most accurate methods for estimating the elapsed time between the explosion and the recording of the resulting vibration as it arrives at a distant receiving instrument. The equipment necessary for field operation is described.

In the last part of the article, Rieber explains the interpretation of the results, the construction of graphs, and the development of formulas. The article is illustrated by photographic pictures and diagrams.---W. Ayvazoglou.

RAYLEIGH-TYPE WAVES PROPAGATED ALONG AN INNER STRATUM OF A BODY

By K. Sezawa and G. Nishimura

Bulletin of the Earthquake Research Institute, Tokyo, vol. 5, 1928, pp. 85-91.

The method described in this paper resembles that used in the investigation of Rayleigh-waves on a stratified body. It is noted, however, that the authors have considered cases of both symmetric and asymmetric waves with respect to the central plane of the stratum. The important results are enumerated below:

1. Rayleigh-type waves propagated along an inner stratum of an elastic body can be classified into two elementary types. According to the symmetric or asymmetric forms of the waves about the central plane of the stratum, the waves may be designated as symmetric as asymmetric type.

2. Rayleigh-type waves propagated along an inner stratum show a generally dispersive nature.

3. The asymmetric type has a velocity higher than that of the symmetric type for the same values of L/H.

4. Velocities of wave propagation along a stratum are limited between those of distortional waves in the stratum and the outer medium.

5. A smaller ratio of $\frac{\mu'}{\mu}$ gives a longer range of L/H, which keeps the values of the velocity of propagation approximately constant.

6. As $\frac{\mu'}{\mu}$ tends to be very small, the constant value mentioned approaches the velocity of propagation of Rayleigh-waves on a semi-infinite solid body.

7. Energy of waves of short length accumulates in the vicinity of a weak stratum.--Author's abstract.

4. ELECTRICAL METHODS

SOME EARTH RESISTIVITY MEASUREMENTS

By F. W. Lee, J. W. Joyce, and Phil Boyer

Information Circular 6171, Bureau of Mines, Oct., 1929, 16 pp.

Owing to the increasing importance of resistivity measurements made on the surface as an index of underground structure and the difficulty of direct application of a simple mathematical system to the analysis of these measurements, the authors are of the opinion that, unless a new mathematical tool to meet these needs is invented the results must rest for the present upon extensive experimental work, rather than upon possible theoretical deductions. The purpose of this information circular is to set forth some difficulties encountered in solving this problem.

After the discussion of the system of determining the average resistivity of the earth and the factors influencing this resistivity, illustrated by a series of diagrams, the results of the equations derived are shown graphically in a figure.

The second part of the article deals with the "resistivity about a single electrode"; the method consists of using two current terminal connections, usually iron stakes, for connecting current to the ground. The results are presented in a table showing maximum variation of symmetry around a stake electrode.

Another table gives the computation of resistance at various radii between concentric hemispheres. Methods for measuring earth resistivity, surface and structure effects on resistivity, comparisons of measurements, and

ifferentiative resistivity measurements are explained and illustrated by many igures.

The authors conclude that by choosing the points of observation at lose enough intervals it is possible to follow the contour of the various eological beds.

Of course considerable skill is required for the proper interpretation of the results.--W. Ayvazoglou.

TENTATIVE METHOD FOR MAKING RESISTIVITY MEASUREMENT OF DRILL CORES AND HAND SPECIMENS OF ROCKS AND ORES

By M. W. Pullen

Information Circular, 6141, Bureau of Mines, June, 1929, 11 pp.

As the determination of electrical resistivity of the earth may urnish information on the location of ore bodies of economic importance, the nowledge of this resistivity of various rocks is considered to be important o the geophysicist. The author presents a tentative method and gives the results of tests of drill cores from the Mineville magnetite district and of and specimens of serpentine and chromite. Pullen describes (1) the method sed for hand specimens, (2) resistivity measured with direct current, (3) resistivity measured with alternating current, (4) method used for diamond-drill ores, (5) resistivity measurement of drill cores at various depths, and (6) he effect of moisture on resistivity of drill cores.

Tables are given showing the effect of time on resistivity, the effect of direct current voltage on resistivity, the effect of alternating urrent voltage on resistivity, the resistivity measurement of chromite, and he resistivity at various depths. Eight figures are added.

The results of the tests are summed up by the author as follows:

"1. Surface leakages of current must be reduced for reliable resistivity measurements.

"2. Resistivity measurement is associated with electrical polarization, and the factor of time therefore enters as an element in its determination.

"3. The rate of polarization differs in various rocks.

"4. Variation of resistivity is a function of applied voltage and frequency.

"5. Because of low values of measured current, d.c. instruments must be used in a. c. circuits when measuring alternating current resistivity.

"6. There is a difference between alternating-current and direct-current resistivity.

"7. A definite method is proposed for preparing drill cores and hand specimens for resistivity measurements.

"8. Rock specimens of the same classification from different horizons of a drill core may show a wide variation of resistivity due to the latitude in the rock classification.

"9. Water content may greatly alter the resistivity of materials.

"10. Resistivity of a conducting ore body may be high, if the particles of ore are disseminated.

In conclusion the author invites discussion upon the electrical resistivity measurement methods in order to establish a uniform procedure and to adopt a system of rock-resistivity classification.--W. Ayvazoglou.

DIE GEOELEKTRISCHEN UNTERSUCHUNGSMETHODEN MIT WECHSELSTROM NACH DER SONDENMETHODE

(GEOELECTRICAL EXPLORATION METHODS WITH ALTERNATING CURRENT ACCORDING TO THE PROBE METHOD)

By P. Hülsenbeck and W. Geyger

Montanistische Rundschau, vol. 21, No. 1, August 1, 1929, pp. 289-295.

After mentioning Schlumberger's method for discovering useful deposits the authors draw attention to the advantage of using alternating instead of direct current.

A description of electrical methods of prospecting, accompanied by figures, is given. The difficulty of interpreting the curves obtained is explained and the necessity of studying the fundamental differences between the indications obtained on the surface of the ground and those at a depth are noted. The authors conclude that in order to secure good results a fundamental knowledge of the geology of the area under investigation is necessary.--W. Ayvazoglou.

METHOD FOR MEASURING THE SUSCEPTIBILITY OF ROCKS

By J. G. Koenigsberger

Terrestrial Magnetism, vol. 34, No. 3, 1929, pp. 209-214.

Lord Kelvin's mathematical method of electrical images applied to a magnet gives the susceptibility of a body having a plane surface placed near the magnet. The different corrections for varying distance, finite surface area, and finite height perpendicular to the surface are discussed. The method is suitable for use in the field with a variometer to determine the susceptibility of samples of rocks. Crystalline schists and other rocks often exhibit a magnetic anisotropy. A provisional scheme for a magnetic-geological classification of rocks based on remanent magnetism is given. The order of

agnitude of remanent induced MT (M, susceptibility; F, total intensity) is ompared with present values.--Author's abstract

EARTH-RESISTIVITY MEASUREMENTS IN THE LAKE SUPERIOR COPPER COUNTRY

By W. O. Hotchkiss, W. J. Rooney, and James Fisher

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 51-65.

During the summer of 1927 the Department of Terrestrial Magnetism f the Carnegie Institution of Washington joined with the Michigan College of ining and Technology in conducting a series of earth-resistivity measurements n the Michigan copper country. The geological structure in this section is uite varied and is fairly well known.

The purpose of the investigation was to discover the correlation be- ween the variations in electrical resistivity of large masses of soil and ock in place and the geological structure below the surface. The work done ay be roughly divided into two parts: (1) Measurement and study of the varia- ions in resistivity in depth, or with volume, to establish such general rela- ions as exist between the two; and (2) the determination of the specific re- istivity of various formations in order to make available more fundamental ata which may aid in the interpretation of the results of the former type of easurements.

A report by Mr. Rooney, which gives in detail the measurements made nd the results obtained, forms the basis for this article.--Authors' abstract.

ELECTRICAL PROSPECTING FOR MOLYBDENITE AT QUESTA, NEW MEXICO

By Karl Sundberg and Allan Nordstrom

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 125-137.

A survey is described which was carried out during October and Novem- er, 1927, by the Swedish American Prospecting Corporation at the Questa mine.

After briefly discussing the geological conditions at Questa and the xploitation of the molybdenite, the authors describe the "electromagnetic ompensator method used for the survey." This method comprises the determin- tion at every point of strike and dip of the polarization plane and the ampli- ude of real and imaginary parts in micro-gauss per ampere of horizontal and ertical components. The essential instrument used in such a survey is called he compensator; therefore the authors refer to this survey as a survey by the ompensator method. The compensator used was invented by Karl Sundberg and E. . Lindblom.

For reconnaissance work the authors used more simple methods, called he two-frame and three-frame methods, invented by Sundberg.

The results obtained by this survey have shown the possibility of using electromagnetic prospecting for finding small veins with poor conductivity in country of very rugged topography.--W. Ayvazoglou.

OPERATING PRINCIPLES OF INDUCTIVE GEOPHYSICAL PROCESSES

By J. J. Jakosky

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 138-176.

All electrical geophysical methods depend for their operation upon the effects produced by the flow of an electric current. By studying these effects it is possible to predict the general axis of current flow. The greater flow of current is in the path of greatest effective conductivity; and since the effective conductivity of a mineralized zone is different from that of its surrounding envelope (usually much greater), it is possible to locate such a mineralized zone by the distribution of current. Due consideration must be given, of course, to geological structure, to type of mineralization, and to other factors. A number of methods are used to cause this flow of current, and various methods are available for detecting the presence of such current flow and for studying its effects. In a rather detailed way, this paper discusses the theoretical and practical phases of the inductive methods of geophysical prospecting.--Author's abstract.

FIELD OBSERVATIONS OF ELECTRICAL RESISTIVITY AND THEIR PRACTICAL APPLICATION

By J. G. Koenigsberger

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 221-237.

The electrical specific resistance of rocks in the field is measured by sending a current through a medium of great volume, compared to the electrodes, whose resistivity should be measured. The whole resistance can be determined by the Wheatstone bridge and the specific resistance calculated by a well-known formula. The resistivity of some rocks in place in Germany and Switzerland is given--first, of a rock near the surface, and especially near electrodes.

Practical applications are made in the determination: (1) of the continuity of a conducting ore body, (2) of the surface area of an ore body, and (3) in the detection of a water-bearing fault in a salt mine.

Preliminary observations are described: (1) on the influence of the depth of ground-water table, and (2) on the detection of gas under high pressure in coal seams.

The observations in this paper of the electrical resistivity of rocks and soil in place are along the lines of the very interesting method and results of the Messrs. Gish, Rooney, Hotchkiss, and Fisher ("Earth-resistivity

easurements in the Lake Superior copper country" Amer. Inst. Min. and Metall. ng., 1929, pp. 51-65.) All the work described has been done since 1920.--uthor's abstract.

UEBER DIE TIEFENWIRKUNG BEI GEOELEKTRISCHEN RAHMENMETHODEN

(THE EFFECT OF THE GEOELECTRIC FRAME METHODS WITH REGARD TO THE DEPTH OF AN ORE BODY)

By J. N. Hummel

Zeitschrift fuer Geophysik, vol. 5, No. 2, 1929, pp. 72-80.

The magnetic field of a stationary current sent through the underround is examined for proof that rotation bodies of deviating conductivity re deposited in isotropic mediums which otherwise are homogeneous, whereby he axis of rotation is situated in the direction of the homogeneous field of urrent.

It is possible to show that in deposits situated at a great depth he disturbances produced in a normal regular magnetic field on the surface isappear almost at the same time with the distortions in the corresponding otential line figure.--Author's abstract, translated by W. Ayvazoglou.

DER SCHEINBARE SPEZIFISCHE WIDERSTAND

(THE APPARENT SPECIFIC RESISTANCE)

By J. N. Hummel

Zeitschrift fuer Geophysik, vol. 5, No. 3-4, 1929, pp. 89-104.

Some geophysical methods are based on the determination of the pparent specific resistance."

In this paper the conception of the apparent specific resistance is xplained, different ways for its disclosure are given, and the theory of the orresponding methods of solution is developed. These methods have proved to e suitable for the discovery of the disturbing bodies; but their real function is to indicate the character of the subsoil formed by horizontal layers. alculations are given for two special cases and the results are discussed.--uthor's abstract, translated by W. Ayvazoglou.

MODELLVERSUCHE MIT DER VIERTELWELLENMETHODE

(MODEL EXPERIMENTS WITH THE METHOD OF QUARTER-WAVES)

By J. N. Hummel

Zeitschrift fuer Geophysik, vol. 5, No. 3-4, 1929, pp. 104-118.

With the method of quarter-waves the proceedings take place in a one close to or between a swinging dipol-antenna. Therefore all the three

members of Hertz's radiation equation must, in the theory, be taken into consideration for the dipol. The reaction of a stratum of very good conductivity upon the sender is calculated from this point of view.

In making model experiments, extremely short waves are produced according to the Barkhausen and Kurz methods. The reaction of a stratum of good conductivity upon the sending dipol is measured experimentally and the curve of the antenna current is drawn. If the simplified assumptions made during the calculations are taken into consideration at comparison, a good conformity between the theory and the practice is obtained.--Author's abstract, translated by W. Ayvazoglou.

CALCULATION OF COMPARISON OF HOMOGENEITY OF FIELDS OF SCHLUMBERGER, LUNDBERG, AND PETROWSKY

(In Russian)

By R. Skariatin

Bulletin of the Institute of Practical Geophysics, No. 4, 1928, pp. 256-265.

Contents of the article:

1. Advantages concerning the different methods of placing the electrodes.
2. Calculation of Schlumberger's field.
3. Calculation of Lundberg's field.
4. Curves of homogeneity.

Owing to the fact that Schlumberger's field has, notwithstanding its great simplicity, one big disadvantage, that of heterogeneity of the electric field obtained, Lundberg's and Petrowsky's fields are used almost exclusively in the U. S. S. R.

As the calculation of Petrowsky's field has already been given in a previous article, "Calculations of an artificial electric field" (see Geophys. Abs. No. 1, I.C. 6120), Skariatin gives here only calculations concerning Schlumberger's and Lundberg's fields. The calculation of Schlumberger's field has been made according to Petrowsky's formulas and tables.

The calculation of Lundberg's field, which is somewhat more complicated, has been made by the application of the potential numbers given in a special appendix. The equipotential lines obtained are shown in a figure in which it can be seen that Lundberg's and Petrowsky's fields differ very little only.

In the last part of the article the question of the homogeneity of the three fields is discussed, and, based on the curves of homogeneities given

the article, the author concludes that the most homogeneous field is that Petrowsky. Lundberg's field differs very little; that of Schlumberger, of urse, can not be compared with the other two because the curves of homogenty have another form which is caused by the quite different method of setting e electrodes.—W. Ayvazoglou.

5. RADIOACTIVE METHODS

THE ABSORPTION OF PENETRATING RADIATION

By L. H. Gray

Proceedings of the Royal Society
Series A, vol. 122, No. A790, pp. 647-668.

Adopting the hypothesis that penetrating radiation is a type of γ diation, its absorption in the atmosphere is investigated from the theotical standpoint.

1. An attempt is made to establish a quantitative correlation between the ionization produced in an electroscope by penetrating radiation and the scattering absorption coefficient of the radiation.

2. The relative magnitudes of the ionization produced by primary and scattered radiations at any point are computed by approximate methods. The calculations are made on the basis of the Compton scattering formulas, and also on the basis of the new scattering formulas proposed by Klein and Nishina.

3. On the basis of these results the relation between the apparent absorption coefficient of a homogeneous isotropic radiation and the true scattering coefficient of the primary radiation is discussed.

4. The adequacy of the Klein-Nishina formulas to account for the observed absorption and scattering of γ - rays is briefly considered.--Author's abstract.

THE RELATION OF RADIO PROPAGATION TO DISTURBANCES IN TERRESTRIAL MAGNETISM

By I. J. Wymore

Proceeding of the Institute of Radio Engineers,
vol. 17, No. 7, July, 1929, pp. 1206-1214.

This paper presents the results of a study of an apparent interlationship between radio reception and changes in the earth's magnetism. e results show that for long-wave daylight reception over great distances ,000 to 7,100 km.) there is in general a variable but definite increase in

the intensity of the received signal following the height of severe magnetic disturbance. This increase reaches its maximum in from one to two days and disappears in from four to five days. For moderate distances (250 to 450 km.) there is an increase in the intensity of the received signal noticeable before as well as after the magnetic storm reaches a maximum.

These changes in intensity cover periods from two to four days both before and after the magnetic storm reaches its height.--Author's abstract.

BERICHT UEBER DEN JETZIGEN STAND DER UNTERSUCHUNGEN UEBER DIE DURCHDRINGENDE HÖHENSTRAHLUNG

(REPORT ON THE PRESENT CONDITION OF THE RESEARCHES CONCERNING PENETRATING RADIATION)

By K. Wölcken

Zeitschrift fuer Geophysik, vol. 5, No. 3-4, 1929, pp. 151-159.

In the article Wölcken summarizes the results of a series of recent works concerning penetrating radiation. He classifies the works into three main groups:

1. Nature of penetrating radiation,

2. Absorption,

3. Changes with regard to time. (Zeitliche Aenderungen.)

A list of literature and a brief resume of articles mentioned, showing the progress attained in the domain of researches in penetrating radiations is given.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

DETERMINATION OF GEOTHERMAL GRADIENTS

By K. C. Heald

The Oil and Gas Journal, Dec. 5, 1929, pp. 90, 91, 191, 192.

This paper is a report of progress made in determining the relationship between variations in earth temperatures and oil-field structures.

The research has been undertaken by the American Petroleum Institute in order to determine whether or not chemical reactions between petroleum and other substances really are the causes of abnormally high temperatures--a theory which has been popular with many European students.

Different types of structures have been considered, such as the tle folds of Oklahoma, the faulted monoclines of the Balcones fault zone Texas, the compressed and crumpled strata of the California fields, as well the extreme deformation that occurs around the salt domes of Texas and isiana.

The work, which has been in progress since 1927, has been centralized areas where results will be most significant to the petroleum industry.

OKLAHOMA. - Temperatures were measured in wells extending from about miles east of the town of Okemah to Oklahoma City. A temperature of 100° F. been observed in a hole less than 1,500 feet deep near Okemah and at a th of 4,100 feet near Oklahoma. The author notes, although it may be pure ncidence, that the rocks slope in the same direction as the 100° temperature e, at a rate only slightly more abrupt. Future work is necessary to estab- h or disprove this relation.

Local Structure. - The work in Oklahoma offered an opportunity to rn whether local structures--anticlines and synclines--in gently folded ks are reflected by the temperatures in those rocks or not. Heald is of opinion that Van Orstrand's earlier work in Wyoming and particularly on Salt Creek anticline has been substantiated by McCutchin's work in Oklahoma, lving no doubt that in steeply tilted beds such a reflection can be detected many cases.

Chemical Action. - The work in Oklahoma has not yet progressed far ugh to justify any definite statements on the theory that temperatures her than normal will be found above oil fields because of heat released ough chemical reactions involving oil.

Water Circulation. - The regional picture seems to support the con- tion that waters deeply buried in a syncline would move up the dip and ld result in making the temperatures in the "up-dip" areas somewhat higher a given depth below the surface of the ground than are those in the syncline nce the waters came.

Effects of Unconformities. - No particular study of unconformities been made in Oklahoma, but conditions there are suitable for determining ther or not unconformities can be detected by temperature measurements.

Effect of Strong Faulting. - Whether the faulting activity may be de- ted by temperature measurements can not be determined by the Oklahoma work, nce conditions there are not particularly favorable.

TEXAS. Stratigraphic Conditions. - Measurements now available almost, not quite, justify the conclusion that the age of the sediments has nothing do with the temperature conditions.

Period of Cooling. - It would seem reasonable to believe that the mperature of the rocks that had been exposed to cooling would be less than at of rocks that had never been exposed. No decisive opinion is yet justi- iable.

Problem of Unconformities. - This problem is mentioned by the author as being a complex one and requiring more study.

Relation of Earth Temperature to Structure. - A regional picture constructed to show about half the State indicates a belt of comparatively high temperature along the Balcones--Mexia-Luling fault in which the temperature increases with depth at the rate of 1° F. for about 43 feet. In the central region that temperature increases 1° F. for each 50 to 60 feet. Farther west and northwest the average rate of increase is less than 1° F. for about 100 fee The few data available for the great basin of west Texas show that the basin can not be outlined merely by studying the temperature conditions in wells drilled in and near it. For example, in two wells about 25 miles apart, the temperature in one increased at the rate of 1° F. for every 84 feet, and in the other 1° F. for every 137 feet.

Big Lake Field. - The structure of Big Lake field is clearly reflecte by the temperature measurements.

Salt Domes Studied. - Four domes (three of them in the Gulf Coast region) were observed. The work has shown that, in so far as this type of structure is concerned, the presence or absence of oil has no determinable effect. General outlines of salt domes can, of course, be located by measurements in very shallow drill holes.

Concentration of Heat. - In neither area has the work been done in sufficient detail to justify conclusions as to the probable conditions responsible for temperature variations.

Regional Metamorphism. - The idea that the amount of pressure to whic a region has been subjected should be reflected in the temperature is not supported by the work in Texas.

CALIFORNIA. Geologic Conditions. - The rocks involved in the California measurements represent a very short period of geologic time. In comparing the results of the California work with those obtained in the other States, the author expresses his preliminary impression that time is not a factor havin an important influence on temperature variations in the earth.

Plan of Work. - The Santa Fe Springs field was chosen for exploration and more than 50 wells have been measured in that field. The data secured in California must be considered dependable, as some of the measurements have been repeated; they were also retested by C. E. Van Orstrand, who used different instruments from those employed by A. J. Carlson.

Results. - A report giving details of the work has been prepared by A. Carlson and is in process of publication by the American Petroleum Institute

Relation of Temperature to Petroleum. - The work in California has so far contributed nothing to help answer the question as to whether or not petroleum itself is directly or indirectly responsible for abnormal earth temperature

Relation of Temperature to Circulating Waters. - Although some of the elds of the San Joaquin Valley have been studied in detail so that it is ssible to outline with reasonable accuracy areas in which certain sands con- in waters that are moving downward from the outcrop and other areas where the ters are either standing still or are moving up towardsthe outcrop, no tem- rature work has been done in these areas as yet.--W. Ayvazoglou.

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7. UNCLASSIFIED METHODS

GEOPHYSICAL INVESTIGATIONS AT CARIBOU, COLORADO

By C. A. Heiland, Charles W. Henderson, and J. A. Malkovsky

Technical Paper 439, Bureau of Mines, 1929, 45 pp.

This paper presents a series of articles on geophysical investiga- ons written with the special object of determining which geophysical method methods would be the most economical and successful in a particular district.

The United States Bureau of Mines in deciding to begin this study, ought it most advisable to select for this work a deposit that in part, or a whole, was so exposed at the surface as to enable a thorough study to be de of the relationship of geologic factors to the physical effects produced them.

The following articles are included in this technical paper:

1. Geology of the northern magnetite deposit, Caribou, Boulder County, Colorado, by C. W. Henderson.

2. Geodetic work at Caribou, Colorado, by C. A. Heiland and J. A. Malkowsky. (Plane survey: determination of astronomic north direction, arrangement of stations, topographic survey).

3. Relationship of topography, geology, and magnetic disturbance, by C. A. Heiland. (Method of topographic analysis; application of method at Caribou; agreement between topographic anomalies and earth-magnetic disturbances).

4. Earth-magnetic measurements, by C. A. Heiland and J. A. Malkowsky. (Instruments and procedure: Magnetic field balances, range of instruments, scale-value determinations, use of auxiliary magnets, determination of declination, corrections, computation of magnetic field, graphical representation. Conclusions drawn from magnetic maps: effect of magnetite distribution, factors affecting magnetization of deposits, extent and dip of deposit, discussion of causes of negative anomalies.)

Thirteen figures illustrate the articles, showing: (1) Geologic map northern magnetite deposit, Caribou, Colorado; (2) topographic map and plan

of magnetometer and torsion-balance stations on the northern magnetite deposit; (3) derivation of topography from normal shape produced by erosion of homogeneous mass; (4) topographic gradients; (5) measurement of magnetic vertical intensity; (6) lines of equal anomaly in magnetic declination D; (7) lines of equal anomaly in magnetic vertical intensity $\triangle Z$; (8) lines of equal anomaly in magnetic horizontal intensity $\triangle H$; (9) total magnetic disturbance vectors $\sqrt{\triangle X^2+\triangle Y^2+\triangle Z^2}$ in isometric projection; (10) horizontal magnetic disturbance vectors $\sqrt{\triangle X^2+\triangle Y^2}$; (11) magnetic profile parallel to strike of deposit; (12) magnetic profile perpendicular to strike of deposit; and (13) magnetic profile perpendicular to strike of deposit.--W. Ayvazoglou.

THE FIGURE OF THE EARTH DERIVED BY TRIANGULATION-METHODS

By W. Bowie

American Journal of Science, vol. 18, No. 103, July, 1929, pp. 53-59.

Problems of determining the figure of the earth, as well as the results obtained by geodetical methods of measurement, are briefly discussed. Based on the fact that insufficiency of land area covered by triangulation, (less than 2 per cent of the area of the whole globe), as well as inadequate cooperation between the continents, constitutes the main weakness in the determination of the figure of the earth by means of triangulation and astronomic observations, the author expresses the opinion that better results may be reached after determinations have been made in each of the continents and also when the triangulation of all the continents can be combined in the determination of the figure of the earth.

The cooperation of the United States, Canada, and Mexico in geodetic operations is noted especially. Good results may be expected from this cooperation, as not only the triangulation of the three countries is connected but the same spheroid is used in the computations, that of Clarke of 1866 as expressed in meters.--W. Ayvazoglou.

SUR LA RECHERCHE GÉOPHYSIQUE DUE PÉTROLE EN ITALIE

(CONCERNING GEOPHYSICAL PROSPECTION FOR OIL IN ITALY)

By Arnaldo Belluigi

La Revue Pétrolifière, No. 346, No. 16, 1929, pp. 1617-1618.

Belluigi describes the work on oil prospecting done in the plain of the river Po. Four thousand torsion balance measurements and several thousand electrical measurements were made. Seven anticlines were established. Isostatic reduction has been carried out by pendulum measurements.

The author examines briefly some geophysical questions concerning prospecting for oil in the plain of the Po, such as: (1) The characteristics of the deep cores which showed gravimetric anomalies; (2) the problem of the form; (3) the problem of the perimeter; (4) the problem of the tectonic axis; (5) the question of the magnetic relief; (6) the question of the electric relief.--W. Ayvazoglou.

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No. 10

Compiled by Frederick W. Lee [2]

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1 - GRAVITATIONAL METHODS

ZUR BESTIMMUNG VON LAGE UND AUSDEHNUNG EINFACHER MASSENFORMEN UNTER VERWENDUNG VON GRADIENT UND KRÜMMUNGSGRÖSSE

(DETERMINATION OF THE POSITION AND EXTENT OF SIMPLE BODIES BY USE OF THE GRADIENT AND CURVATURE VALUES

By Karl Jung

Zeitschrift fuer Geophysik, vol. 5, Nos. 5 and 6, 1929, pp. 238-252.

This paper is an addition to the work of the author which appeared in vol. 3, (1927) of the Zeitschrift fuer Geophysik. (See Geophys. Abs. 2) Methods are derived for the determination of the position and extent of simple bodies from the gradients and curvature values measured by the Eötvös torsion balance. The knowledge of the density difference of the deposit as compared with its surrounding bodies is assumed. The methods deal only with the so-called "two-dimensional" deposits; that is, deposits having the shape of a horizontal cylinder or prism greatly extended.

Examinations are made of deposits having a square section and situated perpendicularly, such as the perpendicular faults and symetrical anticlines and synclines.

The last section contains approximate formulas for small gradients of inclined bodies, anticlines, and synclines. An example of a gradient that may be considered small in amount is given (in case of a careful use of the curvature value to about 15°).--Author's abstract, translated by W. Ayvazoglou.

DIE GRAVIMETRISCHEN VERFAHREN DER ANGEWANDTEN GEOPHYSIK

(THE GRAVIMETRIC METHOD OF APPLIED GEOPHYSICS)

By Hans Haalck

Mainka's Sammlung Geophysikalischer Schriften, Nr. 10, Gebrüder Borntträger, Berlin, 1929, 205 pp.

The contents of this book comprise: Historical development of gravimetric measurements and the position of gravimetric methods among the geophysical methods of prospecting; properties of the potential and of level surfaces; measurement of the variation of the direction and intensity of gravity, chiefly a description of the pendulum method; measurement of the gradient and differential curvature with the torsion balance; the theory, and description of the Eötvös torsion balance; analyses of the results of torsion-balance surveys, the effect of topographic irregularities, graphical calculation of the terrane effects, construction of isogams, calculation of deflection of the vertical, anomalies produced by special types of subsurface bodies, diagrams as an aid to the interpretation of torsion-balance surveys, theoretical relation between gravimetric and magnetic measurements; physical-geological evaluation of

bserved gravity anomalies, general discussion, specific gravity of different pes of rocks, practical examples, mine surveys, surveys of ore deposits, Kursk an example of relation between gravity and magnetic anomalies; field of plicability and future potentialities of the gravimetric method of exploration.

This book, although uninspired and rather elementary, is a creditable, ll-rounded, fairly well-balanced summary of the main points of the gravimetric thod of prospecting. It is written in Haalck's usual easy German and easily-llowed flow of thought. The mathematical discussion is in simple terms of mple calculus. More advanced exposition of the torsion-balance method and re elementary statement of the mathematical theory of the torsion balance is ailable in English. Although mostly listed in the bibliography, the extensive ries of English and American papers on the torsion balance seemingly had not come available to the author before the publication of this book.

Some statements are not according to the reviewers experience: For le study and analyses of faint anomalies, more exact methods of adjustment than hat given by the author are necessary, and the least-square adjustment of a rimary net of lines is faster and, on many surveys, less wearing on the disposi-ion; in a few cases, a simultaneous least-square adjustment of all stations ives a worth-while increase in accuracy. Isogams usually rather than occasion-ly are of value in interpretation, except in simple situations. Maps showing ual value of U_{xy} and $U_{\triangle}$ commonly also are of value. Graphical calculation of le terrane correction such as described by Haalck, although superior to the lalytical calculation, is too slow compared to yet other methods for routine rk. The assumption of infinite extent at right angles to the vertical plane the section is not permissable for many types of structures, but graphs simi-r to Haalck's charts, Figures 70-c and -d, with prisms of finite length are sily constructed and as easily used as the "infinite" charts. For structures thout an axis of symmetry, various types of "contour" methods are available. le positive gravity anomaly characteristic of the Gulf Coast salt domes is not le solely to specific gravity of the unconsolidated Plio-Pleistocene sediments wer than that of the salt and is present on shallow domes where no cap rock is esent. The maximum number of stations which is possible per day per torsion lance is not three, but five--at least with Süss visual instruments and not ss than five readings, with favorable terrane, and with station intervals of 1 ilometer or less.--Donald C. Barton.

THE EÖTVÖS-RYBAR AUTOMATIC TORSION BALANCE

(Source of information not given)

Professor Dr. Stephen Rybar, formerly first assistant of Baron R. Eötvös d now director of the Physical Institute at Budapest constructed a new small-pe automatic registering torsion balance.

The Eötvös-Rybar torsion balance can be used both for automatic registra-ion or visual observation day and night under most unfavorable weather conditions. oth the gradients and horizontal directing tendencies will be determined nearly ith the same accuracy. The time between each observation is 40 minutes.

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Visual observation will be made by the aid of an arm with telescopes and scales. The arm can be easily removed or replaced on the balance.

In automatic registration the turning of the balance in different azimuths is made by the strong spring the clockwork placed in a dustproof box in the lower part of the balance. The first impulse of movement is given by contact clockwork. This is not built in the instrument itself but in a separate box simply placed below the balance and connected to it by a wire. The whole mechanical part of the instrument can be easily removed and cleaned or replaced by spare clockwork in a few minutes.

The slide containing the photographic plates placed in the lower part of the instrument moves with turning the balance itself. It is therefore impossible for the balance to turn or for the plate to get stuck. By pressing a button the slide and the whole optic system can be removed for adjustment or cleaning.

The torsion wire is made of special material with high tensile strength and low torsion resistance. An increase of sensitiveness of the torsion balance, however, was found unnecessary, the properties of the torsion wire have been used for shortening their length and the length of the beam. The wire with a diameter of 0.01 mm, is strong enough to carry the weight of 56 grams.

Characteristic constants of an Eötvös-Rybar torsion balance: Constant of sensitiveness for directing tendency: 57.10^3 c.g.s. units; for gradients: $\frac{mhl}{t} = 87.10^3$ c.g.s. units.

Length of torsion wire	200 mm.
Diameter of torsion wire	0.01 mm.
Length of torsion arm of the beam	70 mm.
Size of photographic plate	4, 5x6 cm.
Time required for each observation	40 min.
Total height of instrument without tripod	820 mm.
Total height of instrument with tripod	1,460 mm.
Weight of instrument with tripod	35 kg.
Weight of telescope arms	3.7 kg.

-- O. Weiss.

GRAVITY OBSERVATIONS IN THE SOLIKAMSK AND BEREZNIAKY DISTRICTS IN THE NORTHERN URALS IN 1926 AND 1927

By B. Numerov.

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 261-265.

In this article Numerov describes the gravity surveys made for the purpose of establishing the underground salt relief situated among known boreholes. The region was investigated during 1926 and 1927 by several parties. Bamberg-Schweydar's variometers have been used and about 700 stations measured.

The results of gravity observations are shown in three maps and the depth h of the salt-bearing mass and marks of $\triangle g$ taken from the maps are

ven in a table. The table shows a very close connection between the gravity omalies and the depth of the salt. Maximum anamoly corresponds to the sinking salt and minimum to the rising of it. This dependence is shown graphically a figure.

The full agreement of the gravity survey results with those obtained boring may serve as the best argument in favor of the application of the avitational method of prospecting in this district.--W. Ayvazoglou.

RESULTS OF GRAVITY OBSERVATIONS OF 1928 NEAR LAKE BASKUNCHAK

By B. Numerov.

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 265-268

The present paper contains data of gravity observations near the lake Baskunchak (250 km. to the north of Astrakhan). An area of about 1,600 uare kilometers has been investigated. Two Schweydar-Bamberg torsion balances os. 533 and 562) were used. Investigation was made of 268 points, situated out 500 meters apart; in regions with a strong anomaly developing steadily er a vast area a route survey with points of 3 to 5 kilometers was investi- ted. In a figure showing the anomaly of gravity near Lake Baskunchak, the lues and directions of the greatest changes are given. The observed anomaly n not be explained by corrections for isostasy and depends entirely on the ological structure of the nearest earth strata (to 10 km. in thickness).

In conclusion, Numerov draws attention to the necessity of pursuing avitational work which should be conducted by means of pendulums over wide eas, the details being perfected by the torsion balance measurements.--W. vazoglou.

RESULTS OF THE GENERAL GRAVITY SURVEY IN THE EMBA DISTRICT

By B. Numerov

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 268-270

The paper contains the results of a general gravity survey executed thin the area of the petroliferous deposits Dossor and Iskine, Emba district, ar the northeastern coast of the Caspian Sea. Observations were made by hweydar-Bamberg variometer and one Bamberg pendulum. A test of a rapid route rvey with stations through every 3 or even 5 kilometers, under the conditions gravity anomaly in the Emba district, proved to be successful; a series of itermediate gravity minima (domes) between the main minima at Dossor and Iskine s established by 62 stations. Summarized results are given in a map.

The periodical distribution of gravity anomalies is, according to merov, characteristic for the northeastern coast of the Caspian Sea, or even r the whole Caspian region; thus he draws the conclusion that the general avimetric survey of the Caspian region should consist of (1) a route survey with riometers through large intervals; (2) pendulum observations at discovered ints of gravity minima, and (3) a study of more interesting areas from the actical standpoint.--W. Ayvazoglou.

I.C.6253

RESULTS OF GRAVITATIONAL OBSERVATIONS IN THE REGION OF GROZNY IN 1928

By B. Numerov

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 271-275.

This paper discusses the observations undertaken in the region of Grozny to establish the possible anticline fold sunk in the sediments north of the Tersky Ridge. Four Bamberg torsion balances were used, and 802 points in total were observed. The observations were conducted in two parallel lines, and points 250 to 500 meters apart were selected. The total length of the profile completed reached about 200 kilometers. The direction of the profile is shown in a map. From the data obtained, Numerov draws the conclusion that to solve the problem of detecting the buried anticline north of the Tersky Ridge, the observed curve of gravity ought to be corrected for the influence of "deep geology" (original influence), utilizing for this purpose the pendulum observations along the profile under investigation. The results obtained proved, in the opinion of the author, the great importance of pendulum observations, not only for the solution of general geophysical problems but also for the purely utilitarian purposes of geological survey.

Tables showing (1) the anomalies of gravitation in 0.001 centimeter-second $^{-2}$ and (2) results of pendulum observations in North Caucasus in the region of Grozny in 1928 are added to the article.--W. Ayvazoglou.

RESULTS OF GRAVIMETRIC OBSERVATIONS ON THE SHUVALOVO LAKE IN THE WINTER OF 1927 AND 1928

By B. Numerov

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp.276-289

Two series of Experimental investigations were carried out on the Shuvolovo Lake, near Leningrad, to prove the value of the gravitational method of prospecting and the possibility of establishing the relief of the bottom according to the data obtained solely by a gravitational survey. The data has been checked by soundings.

The first series in 1927 and the second in 1928. Fifty-nine points were observed in 1927 with the large Schweydar-Bamberg variometer No. 92 and 189 points in 1928 with the small Bamberg variometer No. 533. From comparison of observations of the first and second series taken a year apart with different instruments at 23 common points, the mean error of one gradient V_{xz} and V_{yz} proved to be equal to $\xi = \pm 2 \times 10^{-9}$.

Two tables showing the results of observations are given.

The instruments were mounted upon three bricks symmetrically laid on ice. Special sledges were constructed for driving the pavilion from one statio to the other. Three stations (some days five) were observed per day. The Bamberg variometers worked satisfactorily in spite of the low temperature, which sometimes reached -32°C.

The contour lines of the bottom of the lake (isobaths) drawn at every ter, with depth marks in decimeters, are given in a figure. Another figure ows the plan of vectors of gravity variations; lines of equal anomaly (isogams) e drawn through every 5 x 10^{-5} centimeters $^{-2}$. A map of curvature gradients given in the third figure. Comparing the maps of isograms with that of depths almost complete identity may be seen. In the last part of the article Numerov rives formulas by which the anamolies of $\triangle$ g may be compared with the h.--W. vazoglou.

2 - MAGNETIC METHODS

MAGNETOMETER STUDY OF ALABAMA AREA

By L. Spraragen

The Oil and Gas Journal, vol. 28, No. 33, 1929, pp. 37, 64-66

The values used in contouring the magnetometer maps of the Alabama ea submitted with this article are based on the United States Coast and odetic Survey.

For this reason the maps do not show detailed structure. However, ese general maps are very valuable for anyone doing magnetometer work in this ate. By using these maps as a guide any small area that has been detailed n then be viewed with relation to the large general features.

For additional magnetometer work these general maps will also be und of great value in determining beforehand what the relief will be so that e instruments can be adjusted at the start if necessary.

Attention is called to those magnetometer features that occur in the eas that are favorable from the geological standpoint, for where a magnetic gh occurs in a region that is favorable for oil accumulation, it should prove teresting to make a detailed study of the area with the magnetometer and use e findings in connection with the geological study of the area.--W. Ayvazoglou.

DIE MAGNETISCHE AUFNAHME DER OSTSEE MIT DEM EISENFREIEN SCHIFF "CECILIE"

(MAGNETIC MEASUREMENTS OF THE BALTIC SEA WITH THE IRON-FREE SHIP "CECILIE")

By M. Grotewahl

Zeitschrift fuer Geophysik, vol. 5, Nos. 5 and 6, 1929, p. 255

Taking into consideration the highly significant work of the nonmag- tic ship "Carnegie" and the importance of magnetic measurements of the Baltic a, Esthonia has built the sailing ship "Cecilie," which practically is iron- ee. Measurements of declination and horizontal and vertical intensities are de. The apparatus used consists of:

1. Plath's compass for measuring declination.

2. Biddlingmeyer's double compass, which proved to be very suitable for the determination of horizontal intensity under difficult conditions.

3. A vertical device, constructed specially, in which a system of needles swinging about a horizontal axis can be placed at right angles to a magnet when the latter is approached in a vertical direction (a modified Russian vertical deflector.)

Measurements have been made since 1927, and the magnetic maps of the Baltic Sea, especially of the Finnish and Bothnian Gulfs and the Bay of Riga, have been considerably improved.--W. Ayvazoglou.

MAGNETIC COMPASSES IN WELL SURVEYING

By Frank Rieber

The Oil and Gas Journal, vol. 28, No. 29, 1929, pp. 143-146 and 190-191

In this article Rieber discusses the results of his researches on the possibility of using the magnetic compass as a means for making surveys in boreholes.

He believes that the discrepancies in actual use can be completely accounted for by the failure on the part of the users to recognize the nature of the instrument with which they were dealing and the possible influence of its surroundings upon the accuracy of the results.

The principles of the new type are explained.--W. Ayvazoglou.

MESSUNG LOKALER ERDMAGNETISCHER ANOMALIEN ZUR BESTIMMUNG DES GESTEINS-- MAGNETISMUS IM FELD UND ZUR VERGLEICHUNG MIT DEM HANDSTÜCK; BESCHREIBUNG EINES VARIOMETERS FUER DEN ERDMAGNETISCHEN VEKTOR.

(THE MEASUREMENT OF LOCAL EARTH-MAGNETIC ANOMALIES FOR THE DETERMINATION OF MAGNETISM OF ROCKS IN THE FIELD AND FOR THE COMPARISON WITH SAMPLES; THE DESCRIPTION OF A VARIOMETER FOR THE DETERMINATION OF THE EARTHMAGNETIC VECTOR.)

By J. Koenigsberger

Gerlands Beiträge zur Geophysik, vol. 23, No. 3, 1929, pp. 248-268.

The vertical intensity was measured in three granite massives. The lo anomalies were due: (1) to topographic effects, and (2) to the varying susceptibility to local or regional magnetic differentiation of the granite. The effec of (2) are of the same order as of (1), as was shown theoretically and proved b observations. The topographic effects of induced magnetism are dependent on th topographic form of the earth surface, but an approximate average value can be deduced with a possible error of ± 20%, namely for the difference (a) mountain

inst steep valleys maximal = 15 K Z; (b) for a vertical wall (e. g., stone rries) against plain = - 4 K Z; (c) for a hole surrounded on nearly all es by rock = - 8 KZ. Z is known and - K was observed on samples of the rock. calculated effect, therefore, can be compared with the observed. In one nite (Aare massif) the largest difference for (a) given by observations was ut 20 - 30 % ; K observed (average value of specimens) was 3 . 10 -5; Z is about 0.4 c.g.s., and therefore the difference calculated about 20 % . -- another granitic massif (Gotthardpass) the average difference for a), not the imal, was observed equal to 12 % ; the average K was found on specimens 15 - . 10^{-5}. Therefore (a) calculated about 10 - 15 % . The topographic effects thus be approximately explained by induced magnetism, and the same is true of er rocks massifs. Conformably the remanent magnetism of these alpine, partly shed and metamorphised granites was found by direct observations to be rela- ely weak. The remanent magnetism of some normal granites of Germany of the e susceptibility is larger.

On the wall of stone quarries in a gneiss region, where Z was measured ear before, the whole variation of Z, H, δ was now observed. Z was in accord- e with the value found before. H and δ were found to be also affected by the pgraphy. The variometer used for determination of the variation of Z, H, δ of the absolute value δ and H and for measuring the susceptibility K of rock cimens is described. Two magnetic profiles of Z from one alpine massif to the t through a region of an alpine tectonic line of first order were observed; special magnetic variation was found. The same was true for some minor tec- ic lines in the Rheintalgraben near Freiburg im Breisgau.--Author's abstract.

DIE GRÖSSENORDNUNG DER LOKALEN MAGNETISCHEN VARIATION UND DIE METHODOLOGIE DER MAGNETISCHEN AUFNAHMEN

(THE ORDER OF VALUES OF THE LOCAL MAGNETIC VARIATIONS AND THE METHOD OF THE MAGNETIC SURVEY

By Boris Weinberg

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, p. 321

The author draws attention to the overestimation of the accuracy of surements required during the magnetic survey and to the underestimation of desired distance between the observation points. Several investigations to ermine the order of values of these variations have been made by the author h Cyril Weinberg in Russia. The author expects to publish the results of his estigations in this magazine after the data is completed.--W. Ayvazoglou.

HANDBOOK OF MAGNETIC SURVEY (IN RUSSIAN)

By N. V. Rose and N. Trubiatchinsky

Issued by the Geophysical Observatory in Leningrad, 1928

The constant development of magnetometric work and the great need of tructions for making magnetic measurements in the field were the reasons for publication of this handbook.

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In describing the methods of taking magnetic measurements, the author also tried to give briefly the theory of the methods in order to make possible a clear understanding of all the operations carried out during the magnetic measurements. A description of the instruments used, as well as schemes of observation are included in the book, which is published in Russian.--W. Ayvazoglou.

MAGNETOMETER PRACTICE IN THE FIELD

By William M. Barret

The Oil and Gas Journal, Oct. 10, 1929, pp. 148-150 and 245-252.

Barret analizes the causes for nonuniformity of the results of magnetometric observations. He divides the principal sources of errors occurring in magnetic exploration work into two main groups: (1) Errors of interpretation; and (2) observational errors, or errors associated with the field measurements. Only the second group of errors is examined by the author in this article.

The article is divided into the following headings:

1. Magnetometer Characteristics:
   (a) General.
   (b) Scale-value.
   (c) Temperature coefficient.
2. Distance measurements.
3. Location of stations.
4. Instrument set up.
5. Corrections.
6. Computation of data.
7. Miscellaneous.

All the headings are discussed by the author in great detail, and a series of explanatory figures is added. In conclusion Barret draws attention to the fact that some magnetometer operators try to record as great a number of readings as possible within a day's time, although it should be remembered that, for example, 20 accurate readings per day are always preferable to 40 questionable readings. The instrument crew can assist in solving the difficult task of interpreting the magnetic data only by furnishing data upon which absolute reliance may be placed.--W. Ayvazoglou.

3 - SEISMIC METHODS

THE MINTROP SEISMIC METHOD

By Ernest H. Neville

Oil News, London, vol. 26, No. 877, Sept. 20, 1929, pp. 276, 283, 284;
Journal of the Institution of Petroleum Technologists,
vol. 15, No. 76, 1929, pp. 569-573

In this article Neville gives a brief summary of principles and application of the seismic method as developed by Prof. Dr. L. Mintrop. The arrange

t of the instruments for registering the seismograms and a sketch of such a smogram is given in two figures. In a third figure a diagram showing the ory of computation is drawn. In conclusion the author cites some typical mples of the great successes achieved by the seismic method in many parts of world, such as: "Some 60 salt domes have been discovered in Texas and isiana, limestone anticlines and granite ridges have been located in the Near t, whilst faults, synclines and other tectonic features have been determined coal-iron ore districts. One of the most striking applications was the accur- contouring of the surface of the Paleozoic rocks beneath the later looser ata in Holland."--W. Ayvazoglou.

SEISMIC PROSPECTING PATHS

By Maurice Ewing and L. Don Leet

Technical Publication 267, of
American Institute of Mining and Metallurgical Engineers,
Geophysical Prospecting No. 16, 1930, pp. 1-18

This paper gives a detailed theoretical discussion of the geometric h of a seismic impulse in a medium whose velocity is a linear function of depth (V = ay + b). Reflected as well as refracted paths at two adjacent ata of different elastic constant are discussed with great lucidity. It is rretted that data on customary curves of depth as opposed to distance has been itted, as well as the factors of size of intrusion relative to depth and dis- ce from shot point which control the limits of exploration sensitivity.-- W. Lee.

BEMERKUNGEN ZUM NEUSEELANDBEBEN VOM 16 JUNI 1929

(REMARKS ON THE NEW ZEALAND EARTHQUAKE OF JUNE 16, 1929)

By V. Conrad

Zeitschrift fuer Geophysik, vol. 5, Nos. 5 and 6, 1929, 253-254

The perfect diagram of the New Zealand earthquake of June 16, 1929, wn by the Vienna Earthquake Station, gave rise to the author's investigation the question, whether or not the "Frankfurt time curves" published recently B. Gutenberg in his work "Handbuch der Geophysik" can be brought into accord h the mean values of the distance of the epicenter. In this article Conrad ws that there is a possibility of establishing the distance of the epicenter using a simple approximate proceeding, based on the calculations of the time ves derived. The way of finding this distance proves the correctness of the umption on the constitution of the earth which served for the calculation of time curves, thus making the determination of the path and the velocity of wave rays possible.--W. Ayvazoglou.

I.C.6253

A GRAPHICAL DETERMINATION OF THE POSITION OF THE HYPOCENTER OF AN EARTHQUAKE AND THE VELOCITY OF PROPAGATION OF SEISMIC WAVES

By Ryûtarô Takahashi

Bulletin of the Earthquake Research Institute, Tokyo, vol. 6, 1929, pp. 231-244

The present paper deals with a new method of graphical determination of the position of the hypocenter of an earthquake from the seismometrical data obtained at four stations, leaving the velocity of propagation of seismic waves as unknown.

The method is based on the geometrical property that the locus of the point, whose distances from three given points remain in given ratios, is a straight line, and the line passes through the outer center of the triangle having its vertices at three given points.

The method has its own merits in that it can be effective in a possible short time without any tentative method. It is specially fitted for the search of the positions of the hypocenters of the after-shocks of a great earthquake. As an example of such a case, the positions of the hypocenters of the after-shocks of the great Tango earthquake (Japan May 7, 1927) were determined.--Author's abstract.

REPORT ON THE ACTIVITY OF THE EARTHQUAKE RESEARCH INSTITUTE, TOKYO, IMPERIAL UNIVERSITY, 1925-1929

By Chuji Tsuboi

Gerlands Beträge zur Geophysik, vol. 23, No.4, 1929, pp. 430-441

This interesting report on the activity of the Institute was prepared by Tsuboi at the request of Prof. Dr. V. Conrad, editor of Gerlands Beträge. In the preface the author gives a brief account of the scientific organization and the activity of the Institute in its early days. The next section dealing with investigations completed before 1929 is followed by a description of the investigations of the great Tango earthquake of 1927. In the last section, "Investigations carried out in the first half of 1929," the author describes the achievements of Japanese scientists in the work directed toward solving the problem of how the earth crust would behave under a force of long duration. This problem has been attacked by them from many different directions.--W. Ayvazoglou.

LES TRAVEAUX DE PROSPECTION EN POLOGNE

(PROSPECTION WORK IN POLAND)

By Jean Fevre

La Revue Pétrolifière, No. 353, 1930, pp. 9-10

The addition of geophysical methods of prospecting to the prospection
k in Poland has been decided upon, and first investigations have been started
the region between the Stryj and Swica, to the north and south of the Daszawa.
seismic method has been adopted. The results obtained from the work carried
during the summer and the fall will be published in the near future.--W.
azoglou.

ZUR FRAGE DER LAUFZEITKURVEN

(CONCERNING THE QUESTION OF THE TRAVEL-TIME CURVES)

By Gerhard Krumbach

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 303-314

The mean travel-time curves published previously are corrected, based
the 68 earthquakes which occurred during 1924. A comparison of the new
vel-time curves with those observed during several other earthquakes shows
t their deviations do not correspond one with another in case the regions of
epicenters are different and that these deviations are even different in
e of earthquakes having the same places for the epicenters. These differ-
es are explained by the relationship between the depth of the epicenter and
geological structure of the region of the epicenter.--Author's abstract,
anslated by W. Ayvazoglou.

4 - ELECTRICAL METHODS

ELECTRICAL-RESISTANCE METHOD OF GEOPHYSICAL SURVEYING

By G. F. Tagg

Canadian Mining Journal, Vol. 50, No. 49, 1929, pp. 1156-1159

After mentioning in a brief introduction some geophysical methods of
specting (gravimetric, acoustic and seismic, and electrical) Tagg describes
e detailed the electrical-resistance method.

The description and the use of Wenner's method of measuring the specific
sistance is given briefly and its defects (polarization at the electrodes, stray
rrents, etc.) noticed. The introduction of an apparatus developed by Gish and
oney by which some previous defects have been eliminated and generally satis-
tory results obtained is mentioned.

The last part of the article deals with the Megger earth resistance tester, an apparatus which may be used for the same test but which is more convenient, as it combines generator, commutators and, measuring instrument in one portable case. Its considerable advantages consist of being self-contained and readily portable, simple to use, and direct reading.

A diagram of connections of the megger is given in a figure. A number of surveys, mainly in America, have been carried out with the megger and the results agree with those obtained with the Gish and Rooney apparatus. The instrument has been used by Dr. F. W. Lee, of the United States Bureau of Mines in a survey carried out by him and described in United States Bureau of Mines Technical Paper 440, Measuring the Variations of Ground Resistivity with a Megger.

Tagg concludes that although this description does not pretend to be an exhaustive exposition of the electrical resistance method of geophysical surveying, it does indicates a method which is one of the simplest of the many methods available and does not necessarily require the services of skilled personnel in obtaining the actual results.--W. Ayvazoglou.

GEOPHYSIKALISCHE FELDMESSUNG MIT NIEDERFREQUENTEN WECHSELSTRÖMEN

(GEOPHYSICAL FIELD MEASUREMENTS BY MEANS OF LOW-FREQUENCY ALTERNATING CURRENTS)

By Max Müller

Zeitschrift fuer Geophysik, vol. 5, No. 5 and 6, 1929, pp. 256-259

In this article Müller describes proceedings for making geophysical field measurements by using alternating currents of low frequency, of about 50 cycles, in order to avoid the disadvantages caused by alternating currents of from 400 to 500 cycles (influence of secondary currents induced by magnetic alternating field). Measurements have been made in the Meggener barite-pyrite deposits in Sauerland. The low-frequency alternating current has been taken directly from the lighting lines and directed through a transformer to the two electrodes connected with the earth. The receiving apparatus consisted of an induction frame, a booster, and a rectifier provided with a galvanometer.

A description of the instruments and a picture of the induction frame are given.

The results of the measurements are shown in a figure. The author describes also the experiments made on the anisotropic influence of media upon the distribution of low-frequency alternating currents.--W. Ayvazoglou.

DER SCHEINBARE SPEZIFISCHE WIDERSTAND BEI VIER PLAN-PARALLELEN SCHICHTEN

(THE APPARENT SPECIFIC RESISTANCE IN CASE OF FOUR STRATA THE PLANES OF WHICH ARE PARALLEL)

By J. N. Hummel

Zeitschrift fuer Geophysik, vol. 5, Nos. 5 and 6, 1929, pp. 228-238

The purpose of this article is to show how the apparent specific resis-
ce may be exactly calculated for homogeneous underground covered with two
ata, of any conductivity and any thickness, the planes of which are parallel.
e Abs. 9, Hummel, The Apparent Specific Resistance.) Hummel derives formulas
some special cases on the assumption that all the four layers have any re-
tance whatsoever (the air above the surface of the earth is considered to
resent a layer also.) The corresponding curves are drawn and given in figures.
graphic proceeding is explained and may be used with sufficient accuracy for
determination of curves of any amount of parallel strata, as the calculations
formulas for more than two covering strata become very complicated. Various
ts have shown that the apparent specific resistance may be used as an excel-
t indicator of the character of the underground stratified horizontally. The
erpretation requires, of cource, great experience and theoretical knowledge.--
Ayvazoglou.

VERSUCH EINER ELEKTRODYNAMISCHEN DICKENMESSUNG VON GLETSCHEREIS

(EXPERIMENTS IN ELECTRODYNAMIC MEASUREMENT OF THE THICKNESS OF GLACIER ICE)

By Walter Stern

Gerlands Beiträge zur Geophysik, vol. 23, No. 3, 1929, pp. 292-333

After developing the relations between the capacity of a conductor
electricity and the depth of a stratum differing sufficiently from its sur-
ndings in its electrical conductability or its dielectrical-constant, a
hod is described by which the depth of such a stratum (identical with thick-
s of the covering stratum lying above it) can be determined according to the
ations.

In performing the conditions, which are necessary for the validity of
relations and for the applicability of this method by the ice and the
cier bottom, the question of the usefulness of the method in determining the
ckness of glacier ice can be affirmed -- but at first only theoretically.

The results of the experiments made by the author on a glacier of the
tral east Alps, the execution of which and the apparatus is fully reported,
ht to have confirmed the result of the theoretical researches and have
ved the applicability of the method for the determination of the thickness
glacier ice.

It is highly likely that this method may in principle--although in a changed form and with improved measuring-instruments--be employed for measuring inland ice.--Author's abstract.

DIE VERWENDUNG DER ELEKTRIZITÄT ZUR ERFORSCHUNG DES UNDERGRUNDES

(THE USE OF ELECTRICITY FOR THE EXPLORATION OF THE SUBSOIL)

By H. Haalck

Gerlands Beiträge zur Geophysik, vol. 23, No. 3, 1929, pp. 99-143

After briefly describing in a preface the fundamental principles of electrical methods of prospecting based on the difference in conductivity of rocks and discussing the special place occupied by these methods amongst the other methods (gravimetric, magnetic, seismic), the author summarizes the physical problem in the development of the electrical methods of prospecting as follows:

"By means of which kind of current, supplied in what manner, and by what method of measurement can the distribution of current in a spatial conductor, as represented by the subsoil, be determined in the most suitable and surest way?"

The work is divided into the following headings:

A. The use of direct current.
   1. Methods of measurements.
   2. Natural earth currents.
      (a) The natural potential of ore deposits.
      (b) The "turbulent" earth currents.
   3. Direct current produced artificially.
   4. Measurements of resistance.

B. The use of alternating current.
   5. General possibilities.
   6. The equipotential line proceeding.
   7. Electromagnetic methods of measurement.
   8. Phase-displacement measurements.
   9. Influence and arrangement of the network.
   10. Induced current, electrodynamic wave method.
      (a) Induced current.
      (b) The electrodynamic wave method.

A detailed description of all the headings, illustrated by a series of diagrams, is given.

In conclusion, Haalck analyzes the geological points of view and the difficulties arising during the practical application of the methods. A scheme representing the electrical methods of prospecting is given. The methods having a practical importance are printed in larger type.

Tables showing the conductivity of ores and rocks are added.

In the last part of the article Haalck expresses his opinion on the search for oil by means of electrical methods: "Only under favorable conditions, but which are never known in advance, may the electrical methods of prospecting be of a real aid to the oil-geologists."--W. Ayvazoglou.

ELECTRICAL PROSPECTING OF MINERAL DEPOSITS BY THE METHOD OF EQUIPOTENTIAL LINES

(In Russian)

By J. N. Lepeshinski and D. Th. Murashow

Comité Géologique, Matériaux pour la géologie général et appliqué, vol. 138, Leningrad, 1929, 128 pages.

This publication is one of the series of books on the methods of geophysical prospecting issued by the Geological Committee in Leningrad. (See Geophys. Abs. No. 7 - V. Fredericks.)

The purpose of this book is to describe the practical application of the theory of geophysical prospecting by the method of equipotential lines.

The book is divided into two parts. In the first part the authors describe the apparatus used, as well as the preliminary operations necessary for carrying out the method; in the second part, the influence of various factors upon the character of the results obtained is examined and the experience of field parties showing how the best results may be achieved for each case is described.

The results obtained by the electrical method of prospecting are in many cases verified by the pamphlet, and a list of literature is added. The contents of the book are as follows:

Part I.	Chapter 1.	Apparatus for producing the artificial electromagnetic field in the ground.
	Chapter 2.	Instruments for the investigation of the artificial electromagnetic field.
	Chapter 3.	Preparation of the area and the individual processes of investigation.
	Chapter 4.	Topographic survey of the area under investigation.
Part II.	Chapter 1.	Conditions under which the method of the equipotential lines should be used.
	Chapter 2.	Several cases of the aspect of equipotential lines.

Chapter 3. Interpretation of the results.

Chapter 4. Description of typical areas.

Chapter 5. Historical review of the developments of electrical methods of prospecting in the Geological Committee.

--W. Ayvazoglou.

DIE ANWENDUNG DES KOMPLEXEN WECHSELSTROMKOMPENSATORS BEI GEOLEKTRISCHEN UNTERSUCHUNGEN

(THE USE OF THE COMPLEX ALTERNATING-CURRENT COMPENSATOR FOR GEOELECTRIC INVESTIGATIONS)

By Wilhelm Geyger

Prospector-Institut fuer practische Geophysik und Geologie, vol. 23, 1929, pp. 109-118

In a brief introductory note Geyger mentions the principles of measurement used in geoelectric methods of prospecting based on the difference of electric conductivity of ore bodies. After a brief explanation of these methods the author shows that the use of the complex alternating current compensator offers considerable advantages for geoelectric investigations.

The article is divided into the following sections:

1. Principles of measurement used for geoelectric investigations up to this time.

2. Representation of the distribution of current fields and magnetic fields in space by the deduction of the momentary fields.

3. Measurement of the momentary fields by means of the complex alternating-current compensator.

4. Application of the measurement arrangement to the measurements on the terrane.

5. Practical execution of investigations on the terrane.

6. Concluding remarks.

The pictures added show: (a) The principle of the compensation proceeding generally used in geoelectric methods of prospection with alternating current; (b) resolution of the probe or frame tension into two components (efficiency component and blind component) with a phase-displacement at 90°;

(c) principle of the new arrangement of connections for measurements by using Geyger's sliding-wire alternating-current compensator in connection with a current transformer; (d) phase relation in the measurement according to this new arrangement; (e) tension relations in the so-called circular measurement with constant distance of stake electrodes; (f) measurement arrangement for practical execution of geoelectric investigations on the terrane.--W. Ayvazoglou.

EINE NEUE HOCHFREQUENZMETHODE ZUR REGISTRIERUNG VON BODENERSCHÜTTERUNGEN

(A NEW HIGH-FREQUENCY METHOD FOR RECORDING VIBRATIONS OF THE GROUND)

By P. Liechti

Gerlands Beiträge zur Geophysik, vol. 23, No. 2, 1929, pp. 213-228

The construction and working of a new electric apparatus by which the vibrations of the ground can be measured is described. It consists essentially of a mass of mercury over which a metallic plate is placed. The arrangement works as a condenser in an absorbing circuit coupled to a high-frequency tube transmitter. The surface of the mercury acts then as a free vibratory membrane. The enclosed diagrams show the superposition of the ground-vibrations on those of the free membrane. The new apparatus is simple in construction and use and may easily be transported. Its high sensitivity can still be increased by cascades of low-frequency amplification.

This work is considered by the author to be a preliminary report, as the experiments have been stopped for various reasons. A long list of the literature used is added.--W. Ayvazoglou.

5 - RADICACTIVE METHODS

FURTHER STUDIES ON RAYLEIGH WAVES HAVING SOME AZIMUTHAL DISTRIBUTION

By Katsutada Sezawa

Bulletin of the Earthquake Research Institute, Tokyo, vol. 6, 1929, pp. 1-18

The paper consists of two parts. The first part deals with the problems concerning the transmission of waves on the surface of a semi-infinite solid body and the other treats of the propagation on a spherical surface. The principal results are enumerated as follows:

1. Rayleigh-waves having azimuthal distribution can be transmitted on the surface of a semi-infinite solid or a spherical surface without diffusion of displacements in each wave front.

2. Although in the case of the propagation of Rayleigh waves on plane surface, the nature of the vertical and the horizontal

components of displacement in wave profile and in azimuthal distribution is maintained for all distances, the azimuthal component of displacement quickly disappears as the distance from the origin increases, showing a nature quite different from the bodily elastic waves.

3. The law of pull and push is applicable even to the surface waves, under the restriction that the azimuthal component is out of consideration. This law is also valid in the case of the transmission of waves caused by the arbitrary disturbance.

4. When the disturbance acts on an interior point of the body the azimuthal distribution of displacement on the surface is in conformity with the motion of the source to a certain extent.

5. Even at the equatorial circle of the sphere, long Rayleigh waves, as affected by the curvature of the surface, have the azimuthal and the ordinary components of comparable magnitudes; in the vicinity of the seismic pole these waves have the large azimuthal component compared with the vertical and the radial components.

6. Short waves have the large azimuthal component only in the close vicinity of the seismic epicenter.--Author's abstract.

6 - GEOTHERMAL METHODS

DIE GEOTHERMISCHEN GRADIENTEN DES ALFÖLD

(GEOTHERMAL GRADIENTS IN ALFÖLD)

By Josef V. Sumeghy

Jahrbuch der Königlichen Ungarischen Geologischen Anstalt, vol. 28, No. 3, 1929, pp. 276-370

In the brief preface of this work Sumeghy draws the attention of the readers to the fact that unfortunately not all of the territory of Alföld (the great Ungarian Plain) could be investigated. The geothermic gradients in the Croatian and Slavonian parts of Alföld, as well as in the Banat and Bacska, were not determined. This is especially regrettable owing to the fact that these parts have the greatest number of deep wells, thus the data obtained there would be of great value.

The work is divided into the following chapters:

1. Calculation of the depth stages.
2. Enumeration of the deep wells examined.

3. Reasons for the differences of the geothermal gradients in Alföld.
   (a) The different heat conductivities of the rocks.
   (b) The effect of tectonical causes.
   (c) The effect of heat originated by the decomposition of organic substances.
   (d) The effect of the occurrences of gas.
   (e) The effect caused by the air.
   (f) The effect caused by radium-emanations.
   (g) Other less important effects.
   (h) The influence of deep water.

4. The geothermical depth zones of the Alföld.
   (a) The first geothermal depth zone.
   (b) The second geothermal depth zone.
   (c) The third geothermal depth zone.
   (d) The fourth geothermal depth zone.

5. Relation of the geothermal gradients to the structure of the Alföld.
   (a) The normal geothermal gradient of the Alföld.
   (b) The higher and lower gradients.
   (c) The directions and breaking of lines which can be proved to be based on the lower gradients.
   (d) Transition zones.

A tectonic map of the Alföld and a large number of diagrams and tables re given. A list of 151 titles of the literature used is added.--W. Avvazoglou.

7 - UNCLASSIFIED METHODS

GEOPHYSICAL WORK IN GREAT BRITAIN

By W. F. P. McLintock and James Phemister

Oil News, London, vol. 26, No. 877, Sept. 20, 1929, pp. 273, 276.

Journal of the Institution of Petroleum Technologists, vol. 15, No. 76, 1929, pp. 563-568.

Owing to the considerable interest in physical methods of investigating subsurface geological structure and the fact that the results of this work, carried out principally by commercial companies, have not been published, the Director of the Geological Survey decided in 1927 to inaugurate a program of geophysical work in order to obtain exact and reliable information regarding the applicability of some of the methods to the solution of definite geological problems. The gravitational work of survey by means of Eötvös torsion balance

was first investigated. After a brief description of the elements of the gravitational field, characteristics of areas most suitable for gravitational survey and the methods of survey employed as depending on the type of structure to be investigated, the authors mention the places, selected mainly in areas where the geological elements were already fairly well known, in which the gravitational surveys have been completed (Swynnerton-Dyke, the buried channel of the River Kelvin at Drumry, and the Pentland Fault in the Edinburgh district), and conclude that the experience of the Geological Survey with the Eötvös torsion balance has shown that the method is of considerable value in geological investigation.

The first field test by means of magnetic work has been carried out by A. F. Hallimond over the Swynnerton Dyke; this structure was previously investigated with the torsion balance. Further work, with promising results, is now in progress in the Melton Mowbray district, Leicestershire.

According to the authors there are no published records of seismic or electrical surveys in Great Britain, although such work is being carried out by private companies. A Geophysical Research Committee has recently been appointed for the purpose of encouraging and developing research in the various methods, which, in the opinion of the authors, will become of increasing importance in geological investigations.--W. Ayvazoglou.

ESSENTIAL POINTS IN USE OF GEOPHYSICS

By E. U. von Buelow

The Oil and Gas Journal, vol. 28, No. 33, 1930, pp. 34, 67-68, 104.

In this article von Buelow briefly outlines some of the possibilities of the present geophysical methods and devices and explains where the difficulties in their application are and under which conditions the methods will be of real economic value.

The geophysical methods are divided by the author into two fundamentally different branches:

1. Measurement of natural forces and properties in the earth's field which always are present and beyond our control or influence (gravimetric, magnetic, self-potential-electric, radioactive, and geothermic methods);

2. Measurements of artificially created forces which to a certain degree can be controlled by us (seismic and electrical methods).

The advantages and disadvantages of each of these methods, possible interferences, and their commercial value are discussed and conclusions concerning each method are drawn.

Summarizing all the foregoing investigations, the author is of the opinion that they reveal the fact that for structural studies and studies of the exact shape and position of salt domes, etc., the seismic method of measuring the acceleration of the ground particles is the most reliable and speediest, there-

re the most economic of to-day. Aside from the still unknown possibilities the electrical methods, the author considers the torsion-balance method to next, whereas the magnetometer should be applied very carefully and as a rule y for checking another method.

The author also recommends changing the commercial valuation of geo- rsical methods entirely; until now this was more or less calculated from the ount of acreage covered in a definite period of time and based on the costs r acre surveyed. More stress should be laid on the results obtained.--W. vazoglou.

LES MÉTHODES DE PROSPECTION GÉOPHYSIQUE. LA PROSPECTION DU PÉTROLE

(METHODS OF GEOPHYSICAL PROSPECTING. PROSPECTING FOR OIL)

By B. Sergescu

Annales des Mines de Roumainie, vol. 12, Nos. 10, 11, 12, 1929, pp. 471-481, 523-530, 575-582.

In a series of articles Sergescu discusses geophysical methods of pspecting. The gravitational method, its principles and the instruments used, e described in the first part of the series. The second part deals with the gnetic methods, and the third with electrical methods (direct current, alter- ting current, inductive method, Elbof's method). Description of the other thods is to be given in the next issues of the same magazine. The articles e provided with many diagrams.--W. Ayvazoglou.

GEOPHYSICAL METHODS OF PROSPECTING IN THE UNION OF THE SOCIALIST SOVIET REPUBLICS

By B. Numerov

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 1, 1930, pp. 93-98.

Different institutions and corporations in Russia which use geophysi- l methods of prospecting are enumerated. The results of their theoretical d practical investigations have been published in various papers (Russian: ological Committee, the Institute of Applied Geophysics, the Journal of Oil erations of the U.S.S.R., the Academy of Science of the U.S.S.R., the Astron- ical Institute in Leningrad; German: Zeitschrift fuer Geophysik).

Numerov mentions in particular the following investigations accomplish- in the field, as well as theoretical work in connection with the gravitation- method:

1. The effect on the gravitational field of masses of regular shape.

2. Analytical and graphic methods of calculating terrane effects.

3. Investigation of the particular case of a single limiting surfac

4. The design of a gravitational variometer with three beams.

5. Observations on Lake Shouvalovo and other tests of the same kin

A summary of the progress of the gravitational work carried out for prospecting for salt, oil, coal, and iron ores is given:

Salt. The investigations carried out during the period from 1926 to 1929 have shown that in potash-bearing formations of the North Ural Mountains (near Solikamsk) the isogam maps give a complete account of the structure of the salt strata.

Oil. The observations of 1927-1929 led to the discovery and further study of anticlines of foraminiferal limestone formations on the western coast of the Caspian Sea in Dagestan.

Coal. The observations of 1929 have shown the importance of a gener gravitational reconnaissance for the purpose of the study of the extension of the Donetz coal district.

Iron. The pendulum observations in the district of Krivoy Rog suppl new and important data concerning the geological structure of the region and have shown the presence of a second anticline at a distance of about 10 kilometers from the first.

Tables and gravity map of the Novobogatinsk salt dome, Ural-Emba district, are added to the article. In conclusion, Numerov mentions the first attempts made in Russia for the application of the seismological and electrica methods for the study of geological structures.--W. Ayvazoglou.

GEOLOGICAL PROSPECTING FOR OIL STILL IN RESEARCH STAGE

By William F. Lowe

National Petroleum News, vol. 21, No. 47, 1929, pp. 59-63

The important part of geophysics in petroleum exploration, although proved to be of great value, can not yet be considered anything other than a geologic guide. The findings of the magnetometer, torsion balance, seismograp and the various electrical methods of geologic exploration, have a very defini value when properly interpreted. A clear understanding of the value is necess before a conclusion can be reached concerning subsurface conditions. These instruments can but indicate certain irregularities in the local geological se tion and can not be considered oil finders. The author draws attention to the growing appreciation of the value of micropaleontology. In connection with ge physics by which the structure may be outlined it remains for the paleontologi to furnish the more accurate geologic data.--W. Ayvazoglou.

DEVELOPMENT IN SCIENCE OF GEOPHYSICS

By C. A. Heiland

The Oil and Gas Journal, Oct. 10, 1929, pp. 186-190 and 274

In this article Heiland gives a brief description of the development n science of geophysics in Germany which he had opportunity to study during is recent visit to that country. The article is divided into the following arts:

1. Activities of State institutions and scientists connected with such institutions.

2. Activities of consulting companies.

3. Manufacturers of instruments.

Among State institutions the geophysical department of the state geo- ogical survey under the direction of Dr. Kuehn occupies the main place. The epartment has, as far as the author knows, one torsion balance, three magneto- eters, three seismographs, and some electrical equipment. Geophysical work arried out by this department during the last year is mentioned in the article. he two other State institutions actively engaged in geophysical prospecting are he Geodetic Institute and the Magnetic Observatory in Potsdam. Both of these nstitutions work in close cooperation with the Geological Survey.

The Geophysical Institute in Goettingen and the scientists taking part n the work of this Institute are mentioned. The names of well-known scientists onducting the research work in Germany are given and the work on which they are ainly engaged is described. In concluding the first part of the activities of cientific institutions and individuals engaged in geophysical prospecting, eiland adds a list of literature on prospecting published in Germany.

According to Heiland the number of consulting companies in Germany is omparatively small. There are only two major companies. The "Seismos" which as combined with the "Exploration" some time ago, and the "Elbof" (Piepmeyer). he "Prospection" (Dr. Ambronn) operates at present on a much smaller scale than he two companies first mentioned. There exist two or three more prospecting ompanies, but they have not attained much significance. The methods used by he different companies and their work are mentioned.

In the last part, "Manufacturers of Instruments," the Askania-Werke n Berlin is put in the first place, being by far the largest company. The inds of instruments manufactured by this company are enumerated. A few smaller ompanies such as the Topfer Co. in Berlin, the Haff Co. in Bavaria and the ipindler and Hoyer Co. in Goettingen are added to the list of manufacturers of eophysical instruments.--W. Ayvazoglou.

8 - GEOLOGY

ZUR ERFORSCHUNG DER ERSTEN 100 KM. ERDKRUSTE

(ON THE INVESTIGATION OF THE FIRST 100 KILOMETERS OF THE EARTH'S CRUST)

By J. Koenigsberger

Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 289-299

In a lecture delivered by Koenigsberger during the session of the German Geophysical Society which was held in Dresden from October 3 to 5, 1929, the author points out that interest in the knowledge of the earth's crust is not limited to science only but is important also from the general cultural and economic viewpoint. The author gives a brief report on the static picture of the upper earth's crust based on the known facts and researches made by a series of scientists.--W. Ayvazoglou.

ORIGIN OF HELIUM-RICH NATURAL GAS

By R. C. Wells

Journal of the Washington Academy of Sciences,
vol. 19, No. 15, Sept. 19, 1929, pp. 321-327

Measurements of the separation of hydrogen from carbon dioxide obtained by fractional diffusion through ball clay were made to illustrate a process by means of which natural gas may become enriched in helium in the earth. The bearing of this theory on other theories of the origin of such gases is discussed.

The rate of diffusion of several other gases through ball clay was also measured, and several problems are mentioned for further study.--Author's abstract.

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GEOPHYSICAL ABSTRACTS[1]

No. XI

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

ZUR MESSUNG DER HORIZONTALEN STÖRUNGSKOMPONENTE DES ERDMAGNETISCHEN FELDES

(ON THE MEASUREMENT OF THE HORIZONTAL DISTURBANCE-COMPONENT OF THE EARTH-MAGNETIC FIELD)

By H. Seblatnigg and A. Graf.

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 329-331.

In this article the authors show the advantage of reading the measurements made with the horizontal balance, not in the direction of the magnetic north as is usual, but in the direction of a characteristic profile.

A practical example is discussed. A formula for the correction for the profile-direction is given and curves are drawn to show the values of measurments obtained by both methods.

The curves agree one with the other very well.--W. Ayvazoglou.

UEBER THEORETISCHE KIPPISOKLINEN UND HORIZONTALISODYNAMEN BY INDUKTIONS METHODEN

(ON THE THEORETICAL TILTED ISOCLINES AND HORIZONTAL ISODYNAMICS IN THE INDUCTION METHODS)

By A. Graf

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 331-334.

The normal pictures of the tilted isoclines and horizontal isodynamics are calculated theoretically under the assumption that the conductivity of the earth is homogeneous; but this assumed condition, as a rule, does not exist. How much these pictures are influenced by the tectonic masses, as well as the various deposits, is shown in parts of pictures representing the zones affected by the disturbances.--W. Ayvazoglou.

TWO GRAVITATIONAL SURVEYS IN SCOTLAND

By McLintock and James Phemister

The Iron and Coal Trades Review, vol. 119, No. 3,226, 1929, p. 981.

The Summary of Progress of the Geological Survey of Great Britain contains accounts of two gravitational surveys made in Scotland. One of these, entitled "A Gravitational Survey over the Buried Kelvin Valley at Drumry, near

lasgow," has already appeared in the Transactions of the Royal Society of Edinurgh (See Geophys. Abs. No. 2); the authors' summary of the other, entitled "A ravitational Survey over the Pentland Fault, near Portobello, Midlothian, cotland," is given in the present article:

"1. The variation in the gradient determined along a series of traverses learly indicates the existence of a fault accompanied by minor folding.

"2. The maximum gradients in each traverse have a high value and lie on a ine which is parallel to the line of the Pentland Fault as plotted on the 6-nch Geological Survey map, and 180 yards east of it.

"3. The buried outcrop of the fault is close to the line of maximum gradent and its strike is at right angles, within 3 to 4° to the average direction f the gradients on each traverse.

"4. The fault is reversed and heads steeply towards the west or upthrow ide; it strikes N.NE. to S.SW.

"5. The heavy horizon west of the fault is the Arthur's Seat lavas with a educed specific gravity of 2.82. Their thickness, estimated from the values f the gradients, is 500 to 600 feet, and their depth below the surface at the ault is 150 feet; this depth is increased to fully 250 feet by sharp synclinal olding west of the fault. Reasons for possible qualifications of these figures re given in the paper.

"6. The strike of the minor folding west of the fault is deduced as almost ue north and south.

"7. The strata immediately east of the fault are very steep and possibly eversed.

"8. The strike of the sedimentary rocks deduced from the gradients along he east traverse is practically the same as the strike observed in the nearest xposures.

"9. The outcrop of a dense stratum, probably the Gilmerton limestone, was ocated at 130 to 140 feet west of the inferred position of this limestone. The ravitational results in this area are so complicated that the authors doubt if his location would have been made unless the geology had been fairly accurately nown.

"10. The absence of pronounced local anomalies in the gradients indicates hat the surface between rock and drift is regular, as might be expected, since t forms part of a raised beach. Abrupt local changes in the thickness of the rift are indicated at two places; in the one case the presence of a buried hannel, in the other, a buried cliff, is suggested. The average depth of drift n the area surveyed appears to be about 20 feet.

"11. Quantitative deductions were not made from the residual curvature alues, but in several respects these afforded a valuable qualitative check on he deductions made from the gradients. The existence of the shallow structure

on the south traverse, which may be a buried channel, was shown by the curvatures and not by the gradients."

The Eötvös torsion balance has been used in making the survey.--W. Ayvazoğlou.

SUL CALCOLO DELLA PROFONDITA DI MASSE PROFONDE GRAVIMETRICAMENTE DISTURBANTI

(CALCULATIONS ON THE DEPTH OF SUBTERRANEAN MASSES BASED ON GRAVIMETRIC DISTURBANCE)

By A. Belluigi

Gerlands Beiträge zur Geophysik, vol. 21, No. 1, 1929, pp. 173-177.

. . . . . The problem of a terrain reduction for a very general case is examined. Formulas for masses situated at great depths are derived, and a case occurring very often in practice is studied.--W. Ayvazoğlou.

RELATIVE SCHWERKRAFTMESSUNGEN NACH DER REFERENZMETHODE MIT DRATHLOSER FERNSTEUERUNG DER KOINZIDENZ-APPARATE UND ERSTMALIGE MESSUNGSERGEBNISSE.

(RELATIVE GRAVITY MEASUREMENTS BY MEANS OF THE REFERENCE METHOD WITH THE REMOTE WIRELESS CONTROL OF THE COINCIDENCE-APPARATUSES, AND THE RESULTS OF THE FIRST MEASUREMENTS)

By Ernst Berger and Karl Mader

Gerlands Beiträge zur Geophysik, vol. 21, No. 4, 1929, pp. 355-365.

In the first part of this article Berger gives the description of the method and of an apparatus by which the control of the coincidence apparatuses and chronographs used for the measurements of the relative gravity is made possible by wireless.

Exact reference measurements can be made at any amount of stations; the coincidence-apparatuses of these stations are driven by the second-swings of one astronomical clock common to all stations.

In the second part (Results of the first measurements) of the paper Mader describes the practical application of the method and gives the results obtained by such a wireless reference-measuring of gravity.--W. Ayvazoğlou.

GEOPHYSIKALISCHE PROBLEME DES RIESES

(GEOPHYSICAL PROBLEMS OF THE RIES-MOUNTAINS)

By H. Reich

Zeitschrift der Deutschen Geologischen Gesellschraft, vol. 81, No. 3/4, 1929, pp. 99-109.

In this paper Reich examines the data established so far by magnetic and pendulum measurements to determine whether or not they are sufficient for

he enlightenment of the Ries problem.

At the end of the article he brings up the question of what can be one by geophysics for the explanation of the Ries problem.

The results of gravity measurements made by different scientists since 901 are summed up by the author as follows:

1. Ries is situated at the border of two large tectonic earth-masses: lpenrandsenke-Süddeutsche Hochscholle.

2. A gravity foundation extends in the direction from W.SW. to E.NE. in he southern part of Ries; in the region of Ries it is broken into many parts.

3. Inside of Ries, in its northern part, there is a gravity deficit having he form of a crater.

The results of magnetic measurements are studied mainly from Hauss-ann's declination map of south Germany and are summed up as follows:

1. The magnetic anomalies of remote regions of Ries are probably caused y old crystalline mountain chains extending from E.NE. to W.SW.

2. This regional anomaly is disturbed in the region of Ries itself. A ole, having a crater form, is formed in the original rocks near Klosterzimmern -Dürrenzimmern--and the earth-masses are partly broken near Alerheim.

Thus in interpreting the geophysical conditions, regional effects must e distinguished from local effects. Only the local effects are connected with he real Ries problem.

The author is of the opinion that a very interesting and valuable pic-ure of the composition and extent of crystallines may be obtained by means of a etailed gravimetric survey, and a still better one by means of magnetic investi-ations. Of course, additional magnetic and gravimetric measurements supported robably by seismic measurements are required in order to obtain reliable data.

In conclusion, Reich sums up his ideas on the Ries problem, as based n geophysical measurements and geological conditions, as follows:

"1. The volcanic structure of Ries is probably connected with the magnetic-ectonical proceedings at a great depth (similar to the Steinheim Basin and the egion of Urach) which take place at the border of two large tectonic masses aving various gravity relations and various tendencies of movement.

"2. The expansive magnetic anomalies extending into the remote surroundings f Ries are caused (similar to the gravity line extending to the south of Ries) y crystallines.

"3. This figure, which may be considered simple, is considerably disturbed y the later volcanic manifestations in Ries, as well as in the Steinheim Basin.

"In order to establish a reliable picture, further special investigations by the most modern geophysical means, especially by a magnetic survey, are necessary."

Five figures and a list of literature complete the article.--W. Ayvazoglou.

THE STATUS AND IMPORTANCE OF ISOSTASY

By William Bowie

Mining and Metallurgy, vol. 11, No. 278, 1930, pp. 93-95.

The idea set forth by Bowie that large gravity anomalies are due to the presence of abnormally light or heavy rocks close to the stations having the large anomalies, has received attention and has become at the present time evident by investigations made at many places, mentioned by the author, in which the presence of extra heavy or extra light material close to the surface under the gravity station has been proved to be the cause of large gravity anomalies.

In the paragraph discussing the effect of isostatic compensation, Bowie says that on the basis of the conclusion that gravity anomalies are caused to a large extent by the presence of extra heavy or extra light material close to the station, it is possible to discover with gravity data at least the major features of buried structure. The effect of the isostatic compensation of the local as well as the world-wide topography would be identical for two stations not more than 15 or 20 miles apart.

In the last part of the article the author promulgates a complete gravity survey of this country by which the science of geology and prospecting operations for oil and minerals would be greatly benefited.

He believes also that isostasy must be given full weight in all researches concerning the origin of mountains, plateaus, oceans, and continents, and the causes of earthquakes and volcanoes. The author concludes:

"The purely geodetic phases of isostasy will continue to be the subject of investigations by the geodesists. There is much more to learn and it is hoped that these further investigations based on greater masses of data will clarify a number of points which seem to some investigators to be rather obscure at the present time."--W. Ayvazoglou.

ZUR BEGRÜNDUNG DER LEHRE VON DER ISOSTASIE

(IN SUPPORT OF THE THEORY OF ISOSTASY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 22, No. 1/2, 1929, pp. 115-123.

By neglecting the terms of Bruns in the reduction of values of gravity too great values for gravity over the oceans would be received, even when

ensity below oceans and continents would be equal. Results hitherto received nly by measurement of gravity, therefore, do not provide a basis for the known onclusion upon different distribution of masses below oceans and continents. n this way the theorem of isostasy is deprived of a chief point of support.-- uthor's abstract.

UEBER DIE WIRKUNG DER UNDULATIONEN AUF DIE GRÖSSE DER SCHEINBAREN SCHWERKRAFTSTORUNG

(ON THE EFFECT OF UNDULATIONS OF THE GEOID UPON THE VALUE OF THE APPARENT PERTURBATION OF GRAVITY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 22, No. 1/2, 1929, pp. 124-132.

The purpose of this article is to show that the effect of undulations f the geoid upon perturbations of gravity is four times greater than the ef- fect exercised on gravity by oceanic and continental irregularities in the ar- rangement of masses. The proof is given in an example. Values of the undu- lations upon perturbation of gravity are calculated and shown in a table.-- W. Ayvazoglou.

ISOSTASIE UND HAUPTTRAGHEITSACHSEN

(ISOSTASY AND THE PRINCIPAL AXES OF INERTIA)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 21, No. 1, 1929, pp. 103-111.

The problem of the changes of the principal moments of inertia of the earth, as well as of the position of its principal axes of inertia, caused by proceedings of isostatic reduction seeking an equalization of the irregular dis- tribution of masses has been studied by several scientists (Jung, Mader, Schweydar), but a clear explanation of this complicated relationship has, in the opinion of the author, not been reached yet.

In this article Hopfner examines this problem and sums up his results as follows:

"Changes in the arrangement of the earth's masses produced by proceed- ings of isostatic reduction cause a considerable displacement of the principal axes of inertia in the equatorial plane of the earth, but the amount of this displacement can be computed with great uncertainty only."--W. Ayvazoglou.

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DIE DREIACHSIGE ERDFIGUR UND DIE ISOSTASY

(THE THREE-AXIAL FIGURE OF THE EARTH AND ISOSTASY)

By Karl Mader

Gerlands Beiträge zur Geophysik, vol. 22, No. 3, 1929, pp. 318-326.

Mader formulates the question concerning the possibility of solving the problem of the reality of the ellipticity of the equator as follows:

"If there is no isostasy the difference of the moments of inertia at the equator must, owing to the irregularity of continents and seas, correspond to the difference of the semiaxes A and C of about 300 m.

"In case the isostatic compensation exists, the ellipticity at the equator, as derived from the formula of gravity, must be considered to be illusory, because the difference of A - C of the isostatic earth can in this case be not more than 20 meters."

Therefore the question whether the earth has a three-axial figure or not, can be solved only after the existence or nonexistence of isostasy is proved in some way. In one of his future works the author expects to give some detailed calculations on this question.

His present article Mader sums up as follows:

"The present state of the question relating to the three-axiality of the earth may best be solved under the condition that the visual irregularities of the masses of the earth's crust are considered to be not compensated for by isostasy. The difference of the moments of inertia at the equator caused by the irregularities of masses leads to a difference of the semiaxes A and C of the equator of the order of the value of 300 meters."--W. Arvazoglou.

2. MAGNETIC METHODS

UNSERE HEUTIGE KENNTNISS UEBER DIE VERTEILUNG DES ERDMAGNETISMUS

(OUR PRESENT KNOWLEDGE OF THE DISTRIBUTION OF THE EARTH MAGNETISM)

By A. Nippoldt

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 351-358.

In consideration of the fact that studies of the constant field of earth magnetism are based on results obtained from the magnetic survey on land, and that clearness concerning the extent of the geographic distribution of the

ints at which observations have so far been made is of great importance, ppoldt collected information on the total number of these points.

Nippoldt succeeded in establishing a total number of about 27,000 ints, from which 4,000 observations have been made at sea. The general dis- ibution of all these points over the whole world is given in a table and a p. The mean distance between the stations for single countries is calculated kilometers.

Considering the present information on the magnetic survey insuffic- nt for the solution of the earth magnetism field, the author suggests that w magnetic maps be drawn by the most modern means and without comparing them th the old maps. He proposes that the new original map should be provided th lines established by actual observations only, leaving the completion of e lines to scientists themselves in accordance with their purposes. Another p with lines continued over the whole world could, of course, be prepared for actical purposes also.

A brief criticism of the material collected is added.--W. Ayvazoglou.

UEBER DAS VORHANDENSEIN EINER MAGNETISCHEN WIRKUNG DURCH ROTIERENDE MASSEN UND DIE URSACHE DES ERD-UND SONNENMAGNETISMUS

(ON THE EXISTENCE OF A MAGNETIC INFLUENCE CAUSED BY ROTATING MASSES AND THE CAUSE OF THE EARTH AND SUN MAGNETISM)

By H. Haalck

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 359-366.

If a mass rotates about itself, the positive charges of the atom ucleus as well as the negative charges of the electrons are carried forward. he magnetic fields produced by the movement of the positive and negative quan- ities of electricity do not neutralize one another entirely, and the magnetic ffect of the negative charges caused by the rotation of the body must prevail, wing to the movement of the electrons about the atom nuclei.

According to experimental researches, the magnetic effect produced the rotating masses is smaller than the sensitiveness of the present measure- nt instruments. But there is a probability that, taking into consideration he temperatures and pressures existing inside of the earth, the atomic struc- ure of matter is such that owing to this rotating-magnetic effect the exist- nce of the earth magnetism may be produced.--Author's abstract translated by A Ayvazoglou.

ERDMAGNETISCHE UNTERSUCHUNGEN IN DER GEGEND VON SAINT BOÈS (BASSES PYRÉNÉES)

(EARTH-MAGNETIC INVESTIGATION IN THE REGION OF SAINT BOÈS, LOWER PYRENEES)

By P. Geoffroy and B. Perebaskine

Petroleum Zeitschrift, vol. 26, No. 1, Jan., 1930, pp. 10-11.

An investigation by geophysical methods has been started to establis Triassic formations and their borders in the region of St. Boès. The magnetic method was selected and Haalck's and Schmidt's balances were used.

Notwithstanding the unfavorable conditions of work (anomaly values no exceeding γ, swampy ground, passing of an electric continuous current line, a very rich vegetation) the results of investigation were successful, mainly owi to the following two very favorable conditions: (1) There were only two geolo ical formations, the Cretaceous and the Triassic formation, and (2) the Cretac formation, by which almost the whole region was covered, was of great uniformi

The results of measurements are represented by curves of equal anoma lies. Some of the profiles measured are shown in figures.

Special attention is drawn by the authors to the following facts ob- served in this investigation:

1. The measurement of very small magnetic anomalies is possible under th conditions that the number of geological formations is limited by two or not more than three formations and that each of these formations has constant mag- netic properties. Under these conditions a sufficient accuracy may be attaine without the increase of the price of prospecting per acre.

2. Knowledge of the geology is necessary for the correct interpretation of the magnetic measurements.--W. Ayvazoglou.

ON THE DIURNAL VARIATION OF THE HORIZONTAL COMPONENT OF TERRESTRIAL MAGNETISM (In Russian)

By E.-V. Kral'au

Journal of Geophysics and Meteorology,
vol. 5, No. 4, 1928, Leningrad, pp. 295-308

The amplitude of the diurnal variation of the horizontal component i a function of two variables: the number of sun spots and the magnetic latitude of the point of observation. This function is represented by the author in a formula according to which the mean summer amplitudes of the diurnal variation of the horizontal components for different years and for 32 observation statio scattered over the globe were computed. The results of these computations are given in a table and are illustrated by curves. According to the data obtaine

e amplitudes of the horizontal component have maximum values at the equator d the poles and minimum values at about 35° of magnetic latitude.--W. vazoglou.

CATALOGUE OF MAGNETIC DETERMINATIONS IN THE U. S. S. R. AND IN ADJACENT COUNTRIES FROM 1556 to 1926

By B. P. Weinberg

Issued by the Central Geophysical Laboratory in Leningrad, 1929, 215 pages.

The catalogue contains about 11,000 determinations on about 8,400 separate stations. The total number of independent determinations is considerably greater, as the points of observation when situated near to each other were joined into one single station. Explanations to the tables are given in the Russian and English languages.--W. Ayvazoglou.

MECHANISCHE INTEGRATOREN ZUR AUSWERTUNG VON BEOBACHTUNGEN AN GESTÖRTEN SCHWERE UND MAGNETFELDERN

(MECHANICAL INTEGRATING DEVICES FOR THE EVALUATION OF OBSERVATIONS MADE UPON DISTURBED GRAVITY FIELDS AND MAGNETIC FIELDS)

By G. A. Gamburzeff

Gerlands Beiträge zur Geophysik, vol. 24, No. 2/3, 1929, pp. 83-93.

Gamburzeff describes how the magnetic and gravimetric observations ay be interpreted by means of mechanical devices exclusively. The description f mechanical devices by which the derivation of the magnetic and gravitational otential in case of an infinitely long homogeneous cylinder of any cross section may be established is given. A graphical representation of the whole purse of gravity distribution perpendicular to the line of the cylinder envelope can be obtained directly by one of these devices by circumscribing the eriphery of the cross section of the cylinder.

Owing to the well-known relationships between the magnetic and gravitational potentials (in case of homogenous magnetization) this apparatus may be sed for the geological interpretation of both gravimetric and magnetic observations.

Schematic pictures of the apparatus are added.--W. Ayvazoglou.

ZUR FRAGE DER ERKLÄRUNG DER KURSKER MAGNETISCHEN UND GRAVIMETRISCHEN ANOMALIE

(CONTRIBUTION TO THE QUESTION ON THE EXPLANATION OF THE MAGNETIC AND GRAVIMETRIC ANOMALY IN THE REGION OF KURSK)

By H. Haalck

Gerlands Beiträge zur Geophysik,
vol. 22, No. 3 and No. 4, 1929, pp. 241-255 and 385-399.

The article is divided into two parts. The first part deals with (1) theoretical relations, (2) proceeding of calculations, (3) results of measurements, (4) application of the theory to the results of measurements, and (5) the results obtained by borings. This part is summed up by the author as follows:

"After a detailed discussion of the theoretical relations which exist between the torsion-balance measurements and earth-magnetic measurements the calculations were applied to the geophysical measurements of the Kursk anomaly in the region of Stchigry, which is the most explored one. The calculations were carried on under two different assumptions and the results have shown a sufficiently good conformity.

"It was established that the direction of the magnetization of the deposit ($67^{\circ} \pm 8^{\circ}$ inclination in the normal magnetic meridian plane) agrees well with the direction of the normal earth-field in the region concerned ($J_0 = 65^{\circ}$). The intensity of magnetization was expressed as a function of the density difference $\sigma - \sigma_0$ of the deposit with regard to the surrounding rocks to $J = (0.67 \pm 0.13)(\sigma - \sigma_0)$ in c.g.s. units. On the basis of magnetizability and density of samples obtained by boring, it resulted that the intensity of magnetization was about three to four times greater than would correspond to the effect of the induction of the normal earth field."

In the second part of his article Haalck examines the following problems: (6) General reasons for rock magnetism, (7) the earth-magnetic anomaly of Kiirunavaara, and (8) possibilities for the explanation of the reason of the anomaly of Kursk.

The conclusions drawn concerning the second part of the article are summed up by the author as follows:

"Measurements of local earth-magnetic anomalies made so far, have proved that the direction of magnetization of mass-deposits and complexities of layers corresponds with the direction of the present normal earth-magnetic field. The existing exact calculations, the ratio of values of the measured local disturbances to their causes, as well as the essential physical reasons prove that the intensity of magnetization of geological formations also agrees with the induction of the earth field.

"Calculations made with regard to the magnetic anomaly of Kiirunavaara in North Sweden, the magnetic disturbances of which are somewhat analogous to

e Kursk anomaly, have shown that the magnetization of the iron-ore deposit rresponds with a sufficiently good conformity to the induction produced by e earth field.

"The assumption that this rule is correct also for the Kursk anomaly sults in the fact that the main cause for the gravimetric disturbances must e below the iron-quartzite layers reached by borings.

"Considerable objections can be raised against the opinions expressed Lazareff, Gamburzeff, and Polikarpoff, who consider the causes of anomalies be entirely explained by the iron-quartzites established by borings, as they ad to assumptions (which are not very probable) on the extension of the de- sits by which the magnetization of the deposits can not be explained. Based the investigations, it results that the real cause of the magnetic and gravi- tric anomaly of Kursk must be sought for in a magnetic iron-ore deposit with high content of magnetite which probably can be found already at a depth of om 500 to 1,000 meters."

Eight figures are given in the article.--W. Ayvazoglou.

HOTCHKISS SUPERDIP: A NEW MAGNETOMETER

By Noel H. Stearn

Bulletin of the American Association of Petroleum Geologists, vol. 13, No. 6, 1929, pp. 659-677

The purpose of the Hotchkiss magnetometer is to aid in the search for aluable mineral deposits. The history of the instrument culminates in an in- ensive testing period of two and a half years, during which time it has been sted in the field in Arizona, Mexico, New Mexico, Texas, Oklahoma, Arkansas, ansas, Missouri, Illinois, and Wisconsin.

In principle the instrument is designed to measure slight variations the earth's magnetic field. The construction of the superdip is designed to ithstand rough field use. Its manipulation has been simplified to the utmost xtent commensurate with reliable results. The corrections for very precise work re made by eliminating the effects of temperature, diurnal variation, latitude nd longitude. The sources of error, including manipulative, mechanical, and agnetic sources, have been evaluated as closely as possible to date.

The field procedure routine has been evolved to eliminate lost motion.

The application of the instrument to the oil business is exemplified y a picture of the results of a survey made in the Panhandle of Texas, drawn in sometric form.--Author's abstract.

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POMIARY NACHYLENIA MAGNETYCZNEGO W OKOLICACH LWOWA W R. 1928

(MEASUREMENTS OF MAGNETIC INCLINATIONS MADE IN THE ENVIRONS OF LWOW IN 1928)

(In Polish)

By Edward Stenz and Henryk Orkisz

Kosmos, vol. 54, Nos. 1 and 2, 1929, pp. 398-430

The present article includes the results of measurements of magnetic inclinations made in 1928 near Lwow. A dip needle was used.

Two hundred and fifty measurements on 242 points of observations were made on an area of 2,250 square kilometers. The average density of points of observations was about 3 kilometers. Their distribution is shown in a map. The results of observations are shown in tables, and a map of inclinations drawn according to these results is given. In examining the map of isanomalies a series of magnetic anomalies, positive and negative, can be established; the highest anomaly is that of a positive intensity equal to 16 minutes along the river of Rozlocze, extending from SE. to NW. The topographic influence was very small ($\pm$ 0.3'), therefore the anomalies were due unquestionably to the tectonics of the subsoil. The authors note that the magnetic anomalies established by measurements agree well with the geological structure of the area under investigation. Further information on the tectonic structure of this area is expected after a more detailed observation is made.--W. Ayvazoglou.

ERDMAGNETISCHE MESSUNGEN IN DER LICHTENWÖRTHER GEGEND UND AM STEINFELDE IN NIEDERÖSTERREICH

(EARTH-MAGNETIC MEASUREMENTS IN THE REGION OF LICHTENWÖRTHER AND NEAR STEINFELDE IN LOWER AUSTRIA)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 21, No. 4, 1929, pp. 373-386.

During investigations made in 1920 in the neighborhood of Wiener-Neustadt with the Eötvös torsion balance, the magnetic declinations and sometimes also the magnetic horizontal intensities were observed at a series of stations. This article contains information on the arrangement of observations, results and reduction of them. Magnetic declinations, obtained for the different observation stations, were reduced to a station situated approximately in the center of the region of measurements; owing to this a value of the magnetic declination could be established for this station from the total number of observations; this was important because no such observations were made in this region of measurements for several decades, and besides by this a comparison with the corresponding values given in the well-known Liznar tables was possible also. Suitable approximate values of the horizontal intensity were obtained fo

e region of measurements, although no careful arrangements for the establishnt of them could be made owing to the conditions of time.

The results of a detailed survey of the magnetic declination in the ighborhood of one of the observation stations are given in the form of an ppendix.--Author's abstract translated by W. Ayvazoglou.

3. SEISMIC METHODS

EINE EXPERIMENTELLE UEBERPRÜFUNG DER THEORIE DER SCHWINGUNGSMESSER

(AN EXPERIMENTAL CHECKING OF THE THEORY OF OSCILLATION-METERS)

By J. Reutlinger

Gerlands Beiträge zur Geophysik, vol. 24, No. 2/3, 1929, pp. 168-240

Study of the problem of seismographs and oscillation-meters has been arried on by several scientists. On the basis of their results, it has been roved that the single properties of the movement (amplitude of oscillation, elocity, acceleration) can theoretically be determined with great accuracy. n the other hand it also became clear how difficult it is to obtain indisputble records from which the values of these properties of the movement can be erived, based on the theory.

Tests to establish how far the seismographs answer the theoretical alculations were made by Mainka, Galitzin, Geiger, and some others, but horough discussions on the results of these researches have not been published; esides the oscillation platforms constructed for these tests can not be conidered sufficiently accurate for systematic testing of the instruments.

In this article Reutlinger makes an attempt to check the theory of the utomatic seismographs experimentally.

According to the author the tests accomplished by him have shown that he present oscillation-meters answer the theory more or less satisfactorily. he correctness of the picture, and therefore the conformity with the theory, as the greater the smaller the friction was in the joints and the friction aused by the writing pin. Thus the conclusion is drawn that oscillation-meters ith optical recording are preferable to those with mechanical recording. In he latter case all the friction must be reduced as much as possible. The use f an electric-optical enlargement, especially if the enlargement is to be great, s recommended, as the disadvantages caused by the level connections by gearing ay be avoided.--W. Ayvazoglou.

PIEZO-ELECTRIC QUARTZ PLATES

By Charles E. Worthen

The General Radio Experimentor, vol. 4, No. 9, 1930, pp. 1-8

Some information on quartz plates is given for reference when comparing nomenclatures, as there is no standardized terminology so far.

A description of the crystalline quartz used in piezo-electric oscillators is given.

The positions of different axes of a quartz crystal (optic axis, electric axes, mechanical axes) are shown in a figure.

In a table entitled "Common Names Describing the two Usual Cuts for Piezo-Electric Quartz Plates" the different cuts (X-cut, zero-angle cut, face-perpendicular cut, or Curie-cut and the Y-cut, 30° cut, or face-parallel cut) are explained.

Rules which may be helpful for memorizing the location of the X and Y axes and the distinction between the X-cut and Y-cut plates are mentioned. According to the author the crystal is an excellent device for stabilizing the frequency of a vacuum-tube oscillator and when used for this purpose it takes the place of an electrical tuned circuit in determining the frequency of an oscillator. Wiring diagram for a typical piezo-electric oscillator is given in a figure.

Difficulties appearing when the quartz plate is being given its final adjustment and test before being put into use are mentioned.

In the second section of the article Worthen specifies two standardized groupings (types numbers 376 and 276-A) and gives information on frequency ranges and accuracy classification.--W. Ayvazoglou.

4. ELECTRICAL METHODS

DER EINFLUSS DER ANISOTROPIE DER MEDIEN AUF DIE VERTEILUNG ELEKTROMAGNETISCHER WECHSELFELDER VERSCHIEDENER FREQUENZ

(THE INFLUENCE OF THE ANISOTROPY OF MEDIA UPON THE DISTRIBUTION OF THE ELECTROMAGNETIC ALTERNATING FIELDS OF DIFFERENT FREQUENCY)

By Max Müller

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 335-342

Müller describes an electromagnetic method of measurement based on the principle that an alternating current of a low frequency is transmitted without the use of buried electrodes to the anisotropic subsoil by means of induction

f an entirely isolated circuit of rectangular shape; the obtained magnetic ield is measured inside and outside of the rectangle along three directions erpendicular to one another by means of induction coils, booster, rectifier, nd galvanometer. The relation of the components of the magnetic field depends hen upon the position and direction of the cables with regard to the main conuctive axes of the strata.

The intensity of the magnetic field, in crossing the borders of trata of good conductivity, changes at a certain value depending on the charcter of the adjoining media.

A tubular transmitter fed by means of a net anode or an oscillatory udion (Schwing audion) has been used as a generator. The sensitiveness of he receiver amounted to 10^{-8} gauss per scale division. Figures showing the eological structure of the object under investigation, the system of connection f the apparatus, the plan of the site, and the curves drawn from the results f measurements are given.—W. Ayvazoglou.

THE PENETRATION OF ROCK BY ELECTROMAGNETIC WAVES AND AUDIO FREQUENCIES

By A. S. Eve, D. A. Keys, and F. W. Lee

Proceedings of the Institute of Radio Engineers, vol. 17, No. 11, November, 1929,

This paper aims to throw some light upon the much discussed topic of adio penetration and the path of radio waves. Conclusive experimental evidence t the Mammoth Cave of Kentucky, free from all metallic conductors, confirms he hypothesis that radio waves penetrated through the ground and did not ollow air openings or conductors. There is further evidence that audio-frequeny magnetic fields are not greatly damped through an overburden to 300 feet of andstone and limestone having a resistivity of about 50,000 ohms per cm^3.—uthor's abstract.

ELECTRICAL STUDIES IN DRILL HOLES

By E. G. Leonardon

Mining and Metallugical Society of America, vol. 22, No. 10, 1929, Bull. 207, pp. 150-155.

The difficulty of electrical methods of prospecting at great depths henever it is a question of detecting a body of limited size has provoked the cientists to search for means by which the data of investigations may be obained in a way clearer and easier to interpret. The solution may, to a cerain degree, be found when the geophysicist can obtain access to the neighborood of the mass or of the medium to be studied and can send his electrical urrent from below.

An example of how this problem may be practically treated is given y a survey in the coal fields of Vensen (Sarre district). The earth connec-

tion was made in a drill hole at a depth of 1,000 feet, and the other contact was made on the surface at a distance of 4,000 feet west of the collar of the drill hole.

Another test was made in the Carboniferous formations at Longeville (Lorraine) under a cover at 1,500 feet of Triassic sediments. The work consisted of sending an electrical current into the rocks at the bottom of a drill hole at a depth of 2,920 feet, and then of studying the regions south and west of the hole by means of the equipotential curves.

The next step to be taken is, in the opinion of the author, that of attempting to take the electrical reading also in the interior of the soil. With the technique of the potential methods, this consists essentially of measuring the electrical resistivities of the rocks by lowering appropriate insulated cables into the drill hole so as to make observations at a depth on the rocks in place. This electrical characteristic of the rocks can then be studied all along that part of the drill hole which has not been cased. The results can be presented in the form of a graph on which the resistivities are plotted as abscissas against the depths as ordinates.

Leonardon proposes to call this process "electrical coring" and the graph obtained the "Schlumberger electrical log."

In conclusion the author enumerates the advantages of this electrical coring, which may be briefly summed up as follows:

1. It permits the physicist to carry the exploration along and around the drill hole just as completely as if he were operating the apparatus underground himself.

2. It furnished a quantitative characteristic of the rocks traversed by drill holes.

3. For a given horizon, the resistivity measured in the drill hole at a point some distance from the surface is a much more constant and a better defined parameter than the same one would be if the bed outcropped and the electrical measurements were taken at the surface.

4. The cost per foot of electrical coring is very low when compared with core drilling.

Some cases of practical application of electrical coring with good results are mentioned. This technique has been extensively employed by Schlumberger in field work since 1928; at the present time the total length of holes cored electrically amounts to more than 200,000 feet.--W. Ayvazoglou.

MAPPING SUBSTRUCTURE,

By Hans Lundberg

Mining and Metallurgical Society of America, vol. 22, No. 10, 1929, Bull. 207, pp. 155-160

In this article Lundberg discusses his work on the problem of mapping ubsurface structure by means of a new, entirely electromagnetic method.

Of course this method is mainly for use in prospecting for oil and alt, but it might also be of use in finding ore deposits in young bedded formtions. The possibility of mapping structures depends upon the difference in onductivity between different beds in the sedimentary column.

The determination of the depth to the conducting bed in case of only he conducting bed, the other beds being very poor conductors, is examined. iagrams illustrate the results of these examinations.

In the last part of the article Lundberg states that the theoretical roblem of calculating the electromagnetic field caused by any number of conucting beds below each other has also been solved and vector diagrams have een calculated which take in the compound effect of several layers.

Surveys of mapping subsurface structures have been carried on in different countries, and the author expresses the hope that he will be able to publish in the near future a number of interesting and very useful results obtained.

The depth which can be reached depends upon the conditions. Lundberg btained actual results from 1,500 feet, which means that measurements may be aken to any conducting bed within this depth from the surface. About 20 square iles can be covered per month with a prospecting party of two engineers and 10 o 15 helpers.--W. Ayvazoglou.

UNTERSUCHUNGEN UEBER DIE SCHWANKUNGEN DER LOKALEN ELEKTRISCHEN LADUNG DER ERDE

(INVESTIGATIONS ON THE VARIATION OF THE LOCAL ELECTRIC CHARGE OF THE EARTH)

By Rose Stoppel

Gerlands Beiträge zur Geophysik, vol. 21, No. 1, 1929, pp. 116-134.

The variation of the air-electric values (the potential-gradient and he conductivity) correspond with variations of the local charge of the earth hich lead to electric currents. The present work gives a method for measuring he relative amount of these fluctuations and also contains some curves which how the daily march of these variations. From these curves it will be seen hat the extreme values are observed at midnight and noon and that the electric harge of the earth is more negative during the day, and more positive during

the night. The investigations were made partly in Iceland, partly in Hamburg, and in a rural district of the Marn Brandenburg. They all led to the same results. When the sky is overcast the daily variations are smaller and sometimes disappear wholly. Apart from these daily variations the curves show those of longer periods. When it results that the tendency of these curves is parallel to that of the barometrical curves, settled weather can be expected; otherwise an atmospheric change or unsettled weather may come up.--Author's abstract.

KRITISCHE BEMENKUNGEN ZU DER ARBEIT VON B. STOPPEL: "UNTERSUCHUNGEN UEBER DIE SCHWANKUNGEN DER LOKALEN ELEKTRISCHEN LADUNGEN DER ERDE"

(CRITICAL REMARKS ON R. STOPPEL'S WORK: INVESTIGATIONS ON THE VARIATIONS OF THE LOCAL ELECTRICAL CHARGE OF THE EARTH)

By H. Israel

Gerlands Beiträge zur Geophysik, vol. 22, No. 1/2, 1929, pp. 133-137.

Israel draws attention to the errors in Stoppel's article, supporting his declaration concerning the principle that the potential variations of the earth can not be measured. He discusses the possibilities of interpretation of Stoppel's curves by which the diurnal movements of the variations are given, and states that the erroneous interpretation was probably caused by some factors of air-electrical or meteorological origin (see the article above).--W. Ayvazoglou.

DEPTH ATTAINABLE BY ELECTRICAL METHODS IN APPLIED GEOPHYSICS

By A. S. Eve, D. A. Keys, and F. W. Lee

United States Bureau of Mines, Technical Paper 463, 1929, 58 pages.

The authors describe the results of studies performed by them during the summer months of 1928 with regard to the question of the depth attainable in geophysical prospecting. Two results of great importance were established by this summer's work:

1. Confirmation of the Gish-Rooney resistivity method of ascertaining in some localities the presence, depth, and sometimes the thickness of conducting layers far beneath the earth's surface.

2. Introduction of the use of the megger as a simple, available, unpatented method of finding in some localities the presence, depth, and in some instances the thickness of conducting layers beneath the earth's surface (in the present form of the instrument up to 500 or 600 feet).

A region extensively tested by diamond drilling, known as "B. Hill proving grounds," has been selected for the examinations.

The examinations are discussed in the paper under the following headi

1. Natural currents.

2. Parallel wires.

3. Elliptic polarization.

4. Use and value of direction surveys in electromagnetic loop methods.

5. Vertical loop methods.

6. Electromagnetic induction method.

7. Alternating current induction method at F. Hill, 1928.

8. Earth resistivity and geophysical prospecting:

   A. Theory.

   B. Methods and apparatus.

   C. Field work with the megger at B. Hill.

   D. Comparison of three methods at F. Hill.

The arrangements of the tests accomplished by each method, and the instruments used are described. Conclusions are drawn as to the applicability of each method for geophysical prospecting.

The three methods, those of natural currents with porous pots and microammeter, leapfrog, and megger, are compared.

Investigations accomplished by the authors have proved that a great economy in diamond drilling may be obtained by judicious use of an earth-resistivity survey.

Four appendices are added: (a) Details of field work with megger, (b) artificial bodies, (c) experiments with megger, and (d) new use of megger. Fifty-eight figures illustrate the article.--W. Ayvazoglou.

ZUR THEORIE DES ELEKTRISCHEN FELDES DER ERDE

(CONTRIBUTION TO THE THEORY OF THE EARTH'S ELECTRIC FIELD)

By Teodor Schlomka

Gerlands Beitrage zur Geophysik, vol. 24, No. 2/3, 1929, pp. 241-272.

The fact that atmospheric space is charged with electricity is well known. Calculations concerning the intensities of fields on the ground caused by local and cosmic space charges (Raumladung) have already been made by several scientists; but calculations which could be applied for the case in which the density of the space charge has a universal distribution--that is, when it is a function of the geographic latitude only--are so far not known. Schlomka discusses this question and derives formulas referring hereto. The article is

divided into the following four parts:

1. On the influence of the atmospheric space charges (Raumladungen) upon the potential drop on the ground.

2. The diurnal course of the electrical field intensity on the ground.

3. Influence-action of electrically charged spherical zones and spherical caps upon a sphere conductor.

4. Distribution of the charge upon a sphere conductor which is inclosed inside of a conducting envelope and is influenced by the charged spherical zones situated between the sphere and the envelope.

Nineteen figures and many tables accompany the article. A list of literature and a series of notes is added.--W. Ayvazoglou.

ELECTRICAL PROSPECTING FOR ORE AND OIL

By C. T. Tennberg

Chemical Engineering and Mining Review,
vol. 22, No. 255, 1929, pp. 86-90.

Tennberg gives a brief historical sketch of the development of electrical prospecting. Some places in Sweden and in the United States in which this method of prospecting has been applied with success are mentioned.

Neither the scientific aspects nor the theory and particulars of the methods are given.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

EIN TRANSPORTABLES MESSGERAT FUER SCHWERE IONEN

(A PORTABLE APPARATUS FOR THE MEASUREMENT OF HEAVY IONS)

By Hans Israel

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 342-350.

A portable apparatus for the measurement of the number and mobility of heavy ions is described, and a picture showing the arrangement and the dimensions of the parts of the apparatus is given. The essential advantages are summed up by the author as follows: The dimensions of the apparatus are made as small as possible, the time of measurement is greatly reduced in comparison with that used so far, and, finally, the ions of both signs can be measured at the same time.

Formulas for the conditions to which the dimensions of the apparatus ust answer are derived.

The procedure of measurement is given, and diagrams showing the re-ults of the measurements are drawn. In conclusion a table is presented which hows the limits of mobility, calculated for the definite values of the amount f air flowing through per second and for the tension of the condenser, up to hich the ions may still be caught.--W. Ayvazoglou.

DAS WESEN DER HÖHENSTRAHLUNG

(THE NATURE OF THE PENETRATING RADIATION)

By W. Bothe and W. Kohlhörster

Zeitschrift fuer Physik, vol. 56, No. 11/12, 1929, pp. 751-778.

If two Geiger-Müller's tube-counters are placed close together, a onsiderable amount of deflection caused by penetrating radiation occurs at he same time in both tube-counters. From the dependency of the position of he tube-counters, as well as from the frequency of these coincidences, the onclusion can be drawn that the penetration of single corpuscular rays through oth tube-counters is indicated.

The possibility of absorption of these corpuscular rays was estab-ished by putting absorbing layers between the two tube-counters and measuring he decrease of coincidences.

The result was that the corpuscular radiation was absorbed in the ame amount as the penetrating radiation itself. Therefore the conclusion is o be drawn that the penetrating radiations, established by the phenomena ob-erved so far, are of corpuscular nature. Their presumable properties are iscussed from this viewpoint.--Authors' abstract, translated by W. Ayvazoglou.

7. UNCLASSIFIED METHODS

GEOPHYSICAL PROSPECTING - EDITORIAL NOTE

The Science and Art of Mining, vol. 40, No. 6, 1929, p. 85.

This note concerns the geophysical survey in Australia. The survey s conducted by the Imperial Geophysical Experimental Survey, and its primary bject is to make a thorough investigation of geophysical methods of prospect-ng. The results of this experimental work, which probably will be published ext March or April, will put the survey in a position to offer useful data as o the further development of geophysical work within the Commonwealth.

Experiments with gravimetric, electrical, magnetic, and seismic methods are being carried on. The electrical section examined certain zinc ore bodies

at Anembo, N.S.W.; the torsion-balance party worked in South Gippsland, Victori the latter work was continued by a magnetometric survey and produced interestin results in defining the boundary of the brown-coal basin; copper-ore deposits were studied at Walhalla, Victoria, by the same methods; preliminary investigation by electrical methods had also been carried on in Tasmania on pyrite and pyrrhotite deposits containing a certain amount of tin; another preliminary survey was undertaken in the silver-lead ores of northwestern Tasmania, and an examination was begun on the Ringarooma tin deposits; a gravimetric examination had been made of the deep gold leads of Gulgong, N.S.W.

Application of electrical methods for location of water have been mad in the dry areas of the Victorian Mallee country.

A section for seismic work has just been established. The note concludes that in Australia geophysical methods of prospecting are regarded as valuable instruments in the hands of the mining engineers, and the hope is expressed that the information gained by this survey will result in a tenfold benefit to the mining industry.--W. Ayvazoglou.

ANNUAL REPORT OF THE DIRECTOR OF THE DEPARTMENT OF TERRESTRIAL MAGNETISM CARNEGIE INSTITUTION OF WASHINGTON

Reprinted from Year Book No. 28, for the year 1928-29, pages 209 to 276; issued December 12, 1929.

The report contains a summary of the work of the Department of Terrestrial Magnetism covering the time from July 1, 1928, to June 30, 1929.

This work is described under the following headings: (1) Investigational and experimental work (Terrestrial magnetism and electricity and cosmical relations, Research associates and collaborators, magnetism and atomic physics, Experimental work in terrestrial electricity). (2) Field work and reductions (Improvements and cooperation for field and observatory, cooperation with other organizations, Ocean work, Land magnetic survey, Observatory work, Instrument shop). (3) Miscellaneous activities.

A series of abstracts of publications and investigations, as well as a bibliography of contributions, completes the report. -W. Ayvazoglou.

GEOPHYSIK UND STEINKOHLENBERGBAU

(GEOPHYSICS AND THE COAL-MINING INDUSTRY)

By H. Reich

Zeitschrift der Deutschen Geologischen Gesellschaft, vol. 81, No. 3/4, 1929, p. 173.

This article is a résumé of Reich's lecture delivered by him in Bochum, May 10, 1929:

"The direct geophysical information on the presence of coal may be ccessful in very few cases only. Geophysics may be useful to the coal-mining dustry owing to the fact that it is often possible, by means of various pro-edings, to determine from the surface the thickness of the rocks covering the al, as well as to establish the faults. Certain indications for the dis-very of new coal deposits may be obtained from pendulum and magnetic measure-nts. Coal occurs in valleys (coal basins) which are distinguished by magnetic nima and gravity defioits, as well as in lumps on highlands in which, on the ntrary, gravity surplus and magnetic maxima are shown. Deposits of the latter nd only are to be considered for mining in north Germany. Therefore, the in interest is to be concentrated on these deposits."--Abstract translated by Ayvazoglou.

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GEOPHYSICAL ABSTRACTS[1]

No. 12

Compiled by Frederick W. Lee[2]

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[1] - The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U.S. Bureau of Mines Information Circular 6287."

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1. GRAVITATIONAL METHODS

BRUNS' TERM AND THE MATHEMATICAL EXPRESSION FOR THE GRAVITY ANOMALY

By Walter D. Lambert

Gerlands Beiträge zur Geophysik, vol. 24, No. 4, 1929, pp. 371-377.

In this article Lambert examines the following two papers published by Hopfner: (1) Zur Begründung der Lehre von der Isostasie (The basis of the theory of isostasy), and (2) Ueber die Wirkung der Undulationen auf die Grösse der Scheinbaren Schwerkraftstörung (On the effect of undulations of the geoid upon the value of the apparent perturbation of gravity) (See Geophys. Abs. No. 11). Lambert's viewpoint is summed up by him as follows: "Hopfner's conclusion as to the relative magnitudes of the direct effect of irregularities in the distribution of matter and the corresponding indirect effect due to a warping of geoid appear to be unfounded, the error arising from the omission of an important term in the calculation of the direct effect. It is shown that the free-air gravity anomaly and the elevation of the geoid above the spheroid are in general of the same sign. The usual interpretation of gravity anomalies therefore holds good, also the usual arguments based on them in favor of the existence of fairly complete isostatic compensation."

Two remarks concerning Lambert's article, one by Hopfner in which he explains the reason for the difference between the well-known Stockes' formula and that given by Hopfner himself, and another by Lambert in which he defends his viewpoint, are published in the same number of "Gerlands Beiträge zur Geophysik."--W. Ayvazoglou.

THE MEASUREMENT OF THE SECOND DERIVATIVES OF THE GRAVITATIONAL POTENTIAL OVER A BURIED ANTICLINE

By T. H. Jones and R. Davies

Monthly Notices of the Royal Astronomic Society, Geophysical Supplement, vol. 2, No. 1, 1923, pp. 1-32.

The paper deals with the measurement of the second-order derivatives of the gravitational potential over a buried anticline. During the early part of the work many instrumental difficulties were encountered. These were mostly caused by the rapid temperature fluctuations during the night in southwest Persia, where the investigation was carried out. The magnitude and direction of the gravitational force due to the underground mass have been obtained at a number of points on the surface.

The dimensions of the anticlinal mass, and approximate values for the densities of the two uppermost media, have been deduced from the measurements.--Authors' abstract.

THEORY OF A SCHMIDT'S HORIZONTAL FIELD BALANCE

By C. A. Heiland

American Institute of Mining and Metallurgical Engineers, Geophysical Abstracts, 1929, pp. 261-315.

Heiland gives a detailed description of the vertical and horizontal gnetometers. The principal formula for both vertical and horizontal balance r any azimuth and inclination is derived. The theory of various influences at affect the readings are examined. These influences are: (1) False orient- ion; (2) improper leveling; (3) auxiliary magnets; (4) changes in vertical tensity (latitude and anomalies); (5) changes in gravity (latitude and omalies); (6) temperature on readings in general, on the scale value and on xiliary magnets; (7) shape of the knife-edge on subsequent readings and scale lue; and (8) optical influences.

The operation of the instrument, as well as the computation of the sults, is described.--W. Avvázoglou.

GRAVITATIONAL METHOD OF PROSPECTING

(In Serbian)

By D. V. Frost

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry) Belgrade, vol. 1, No. 12, 1929, pp. 531-539.

A brief mathematical theory of the gravitational method of prospecting s given.--V. Gorsky.

2. MAGNETIC METHODS

MAGNETOMETRIC METHOD FOR PROSPECTING DEPOSITS OF LOW MAGNETIC PERMEABILITY

(In Serbian)

By D. V. Frost

Technichki List (Technical Paper), Zagreb, No. 9, 1929, pp. 136-142.

In this article Frost describes the instruments used for examining low magnetic anomalies.

Schmidt's vertical and horizontal variometer and the portable magnetic theodolite manufactured by the Askania Werke. Their mathematical theory is given. The theory of Schmidt's vertical variometer differs in some details from that given by C. Heiland in his article published in "Zeitschrift fuer angewandte Geophysik, 1926.--V. Gorsky.

MAGNETOMETRIC METHOD, ONE OF THE BEST APPLICABLE GEOPHYSICAL METHODS FOR PROSPECTING ORE DEPOSITS IN YUGOSLAVIA

(In Serbian)

By D. V. Frost

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 1, 1929, pp. 13-15.

Examining the geophysical methods of prospecting from the viewpoint of simplicity and cheapness, Frost draws the conclusion that under the conditions of Yugoslavia, the magnetometric method may be applied with the best success.--V. Gorsky.

OSSERVAZIONI SU ALCUNI RELIEVI GEOMAGNETICI NELLA PIANURA DEL PO

(OBSERVATIONS ON THE GEOMAGNETIC RELIEFS IN THE PLAIN OF THE PO)

By Arnaldo Belluigi

Gerlands Beitrage zur Geophysik, vol. 24, No. 4, 1929, pp. 337-342.

Some considerations on earth Magnetic reliefs carried out with Schmidt's balance in the plain of the Po for the discovery of mineral deposits are given. The author indicates the improvements attained during the survey by which small anomalies, which could not be interpreted so far, could be easily explained.

Finally the author shows how elements can be calculated from the results of the survey accomplished which, in connection with the gravimetric results obtained, may serve for the completion and modification of these results.--Author's abstract translated by W. Ayvazoglou.

MAGNETOGRAM SERVICE IS INAUGURATED

By L. G. E. Bignell

The Oil and Gas Journal, vol. 28, No. 41, 1930, pp. 41, 119, 120.

In this article the author states that regular reports of magnetic storms will be published in the Oil and Gas Journal for the benefit especially of the geophysical departments of companies doing the magnetometer work.

A sample of such information printed in the form of a telegram is given. The Tucson magnetic observatory of the United States Coast and Geodetic Survey will be in charge of furnishing this information.

The three components of the earth's magnetic field (declination in degrees and minutes, horizontal intensity, and vertical intensity) are continuously observed in the observatory; the instruments installed for this purpose

re briefly described and a sample of magnetogram showing the record of a mag-
etic storm is given.

A list of articles published by L. Sparagen covering the use of the agnetometer surveys made in several States is added.--W. Ayvazoglou.

CERTAIN ASPECTS OF MAGNETIC SURVEYING

By L. B. Slichter

American Institute of Mining and Metallurgical Engineers,
Geophysical Prospecting, 1929, pp. 238-261.

In classifying rocks magnetically, the inert, highly magnetic, and ntermediate types are briefly discussed, and the peculiar importance of a few f the ferric minerals, and especially magnetite, is explained. Experimental vidence shows that the susceptibility of magnetite changes greatly as the ield strength is changed, and that it also depends greatly on the form in which he magnetite occurs. The hitherto accepted values appear far too low. For ields as weak as the earth's a value of about 0.3 is obtained for disseminated agnetite, while for the solid material a value of 1.5 to 3.0 or higher appears orrect.

Three instances are given of the fact that field observations of in- ensity are often much in excess of those which can well be accounted for by ccepted values of the susceptibility. In each case the higher values here dvocated appear adequate to account for the observed results.-- in two cases t is shown that there is a satisfactory quantitative agreement between observed agnetic data and the form and size of the known ore body which caused the agnetic response.--Author's abstract.

MAGNETOMETRIC INVESTIGATION OF GOLD PLACER DEPOSITS NEAR GOLDEN, COLORADO

By C. A. Heiland and W. H. Courtier

American Institute of Mining and Metallurgical Engineers,
Geophysical Prospecting, 1929, pp. 364-385.

The principal purposes of the investigations described by the authors n this article consisted of:

1. Repeating with modern, more sensitive, and more reliable instru- ents, the magnetometric placer investigations made previously.

2. Disproving the recently advanced theory that deposits of the lacial period have no pronounced magnetic effects.

3. Developing in detail the theory of the magnetic effects produced y placer deposits.

The magnetic field balances for vertical and horizontal intensities which were designed by Schmidt were used for a detailed topographic and magnetometric survey.

The results of the investigation are discussed.

In conclusion the authors express the hope that more examples showing the relation of magnetic anomalies to geologic structure be published in order to avoid the serious mistakes often made in the interpretation of the results.--- W. Ayvazoglou.

3. SEISMIC METHODS

VIBRATION RESEARCH AT STANFORD UNIVERSITY

By Lydik S. Jakobsen

Bulletin of the Seismological Society of America,
vol. 19, No. 1, 1929, pp. 1-28.

The importance of studying the application of the principles of elastic vibrations has caused the construction at Stanford University of a vibration laboratory equipped mainly with a shaking table for carrying out experiments.

The present paper deals with the characteristics of such a shaking table. The purpose of the paper is to make seismologists and engineers acquainted with the properties of the shaking table in order that suggestions for the improvement of the machine and for model-testing may be offered.

After a discussion of the requirements which a shaking table should answer, Jakobsen gives a brief description of the shaking table built at Stanford University. It reads as follows:

> The shaking table at Stanford University consists of a heavy platform mounted on four street-car wheels, and anchored by springs to heavy concrete piers. The platform is made of eight-inch H-beams, bolted and welded together; its dimensions are ten by twelve feet with a weight of approximately six thousand pounds. In order to reduce the friction of the table motion to a minimum, the street-car wheels have been ground concentrically with their axles and have been mounted on ball bearings. The anchoring springs are of the helical type and may be fastened to the truck and to the piers in such a way that they work on compression only. At first a single anchoring spring was used but the difficulty in designing a simple fastening that would insure a constant spring characteristic for extension, as well as for compression, led to the adoption of several anchoring springs on opposite ends of the platform. A figure shows the second design after three anchoring piers had been built.
>
> The impact type of motion is communicated to the vibration table by the following device: A heavy pendulum, approximately eleven

hundred pounds and seventeen feet long, is hoisted to a certain height and then released so that, in its maximum velocity position, it strikes a bumper spring which is fastened to the vibrating platform. The pendulum, returning from its impact with the bumper spring, is arrested in its upper recoil position by a trailing pawl, and therefore does not interfere with the free vibrations of the platform after its first contact with the bumper spring. A figure shows the pendulum with its releasing and arresting mechanisms.

Discussion of the impact motion of the shaking table, analysis of the ransitory motion of an elastic model placed on the shaking table, discussion f the continuous motion of the shaking table, the type of damping and the oblem of dynamic similitude form the theoretical part of the article.--W. yvazoglou.

THE ELASTIC PROPERTIES OF CERTAIN BASIC ROCKS AND THEIR CONSTITUENT MINERALS

By L. H. Adams and R. E. Gibson

Proceedings of the National Academy of Sciences of the United States, vol. 15, No. 9, 1929, pp. 713-724.

The authors have measured directly, at pressures between 2,000 and 0,000 megabaryes, the cubic compressibility of the minerals labradorite, ideite, grossularite and almandite, and of diabase rocks (note: the word diabase" is used in the American sense to indicate a holocrystalline basalt; t should be understood by British readers to mean "dolerite") from Sudbury, anada; Frederick, Maryland; and the Whin Sill in the north of England. By ombining these mineral results with those already known, the authors were ble to give a table of the compressibilities, at various pressures, of all ne important constituents of basic rocks, to compare the compressibilities of he rocks with those of their constituent minerals, and to conclude that the ompressibility calculated from the mineral content gives a limit to which that f the rocks approaches at high pressure. The results obtained demonstrate, urthermore, that at 15,000 megabaryes and 30°C. the maximum velocity of longiudinal elastic waves through rocks of basaltic composition and mode is 7.4 ilometers per second. On the other hand, the compressibilities of garnet and adeite, being found to be surprisingly low, lead to the conclusion that magmas f this composition, crystallized primarily as, or subsequently metamorphosed o eclogites, may transmit longitudinal waves with velocities exceeding 8 kilevers per second. Bearing in mind that the pressures existing at 20, 40, and 0 kilometers below the surface of the earth are somewhat greater than 5, 10, nd 15,000 megabaryes, respectively, the connection between these observations nd deductions concerning the composition of the interior of the earth may be eadily seen. Indeed, the existing data, in the opinion of the authors, place he possible components of the earth, below 60 kilometers and above the core, n the following ascending order of probability: holocrystalline basalt, clogite, pendotite.--Authors' abstract.

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ELECTRICAL METHODS

MESSUNG DES LEITVERMÖGENS DER ERDE FÜR KURZE ELEKTRISCHE WELLEN

(MEASUREMENT OF THE CONDUCTIVITY OF THE EARTH FOR SHORT ELECTRIC WAVES)

By M. T. O. Strutt

Die Naturwissenschaften, vol. 17, No. 37, 1929, pp. 727-728.

The author describes a method for measuring the earth's conductivity based on the measurement of radiation:

The receiver was suspended 13 meters distant from the transmitter at a height of about 15 meters. The transmitter was moved upward and downward, thus producing oscillations in the intensity of receiving caused by the interference of the radiation received directly and that received by reflection. Therefore the intensity of receiving was registered as a function of the height of the transmitting antenna. From the curve obtained the coefficient of reflection of the earth was calculated and from the latter the conductivity could be computed.

The transmitter was a short-wave tube-oscillator producing waves 1.42 meters long. The high-frequency current was modulated to 435 cycles.

The receiver consisted of a tube-detector with low-frequency booster (435 Hertz). The last intensifying step was connected with a tube-voltmeter.

The result of the measurement is shown in a curve. The specific resistance of the ground was measured. Experiments with different kinds of ground will be published by the author later.--W. Ayvazoglou.

THE PHYSICAL BASIS OF THE METHOD OF EQUIPOTENTIAL LINES

(In Russian)

By V. Bursian

Comité Géologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 5-37.

In this article Bursian discusses the physical foundations for the application of electricity for prospecting mineral deposits. He describes the methods generally used, giving preference to that of two parallel linear electrodes proposed by Lundberg.

The theory of measurements of the potential in the field by connecting a potentiometer to two opposite points on the electrodes is examined.

Bursian concludes that, although the method of equipotential lines can not replace entirely the usual methods of prospecting or be used for studyin

ie deposits already established, it may successfully serve for a rapid and heap investigation of large areas.

The anomalies found by this kind of prospection may greatly reduce he area of investigation.

The purpose of this article is to form a basis on which the experi-nts on the electric fields in a tank filled with water and provided with odels of ore bodies were carried out by Dedushkevich, Rodionov, and Sofronov see the following three articles.)--W. Ayvazoglou.

EXPERIMENTS MADE ON THE ELECTRIC FIELDS IN A TANK FILLED WITH WATER AND PROVIDED WITH MODELS OF ORE BODIES

(In Russian)

By S. Dedushkevich

Comité Geologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 37-49

Experiments on models of ore bodies have been carried on by the uthor since 1924 at the State's Physico-Technical Laboratory in Leningrad.

A brick tank 2 by 2 meters by 1 meter was constructed for these ex-periments. The electrodes consisting of two thin parallel wires 1 meter long nd 1 meter apart were placed upon the surface of the water. The square field etween the electrodes was explored by means of an exploring coil fastened to pantograph by which the various positions of the coil were transferred to he plan in natural scale. Alternating current obtained from a lighting cir-uit (50 cycles) through a lowering transformer was applied.

Between the clasps of the transformer a potentiometer was inserted. telephone was introduced (through a three-tube amplifier) in the circuit of he sounding apparatus, and its positions corresponding to the minimum of udibility were found. By plotting these points on the plan it was possible o trace the equipotential lines corresponding to the potential value chosen n the potentiometer. The models consisted of metal plates immersed in water.

The results of the experiments are presented in a series of diagrams nd tables, and a general view of the arrangement of the experiment is given.-- . Ayvazoglou.

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EXPERIMENTS ON MODELS OF ORE BODIES OF DIFFERENT CONDUCTIVITY INSERTED INTO A TANK FILLED WITH WATER

(In Russian)

By S. Dedushkevich

Comité Géologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 49-53.

This paper comprises a description of the continuation of the experiments carried on by the author in previous years (see the abstract above); it is devoted to investigation of the way in which the relation of the objects electrical conductivity to that of the inclosing medium influences the intensity of the indications. In the experiments described in the first paper of Dedushkevich that relation is, roughly estimated, equal to 10^{10}, or practically infinitely large. In order to investigate the question experimentally, the properties of gelatin jelly, as well as of common salt (NaCl) of various concentration, were examined. In taking a gelatin concentration equal to 2 per cent and that of the salt equal to 0, 0.5, 2 and 6 per cent, ratios of the specific resistances of such jellies to that of ordinary water equal to 20, 100, 600, and 1,300 could be obtained. A wooden cylinder, 500 meters long, with an internal diameter of 60 millimeters and walls 10 millimeters in thickness was filled with these solutions. The electrical conductivity of wood impregnated with water differs little from that of water and the thickness of the walls was sufficient, as shown by the experiments, to prevent diffusion during the experiments.

The results of the experiments are given in diagrams. The relative change of the gradient with respect to the normal one for the previously relations of electrical conductivities due to an immersion of the cylinder in horizontal position to a depth of 35 millimeters proved to reach respectively: 1.25; 2; 6; 7. One may conclude that the ratio 100 will produce an effect which may not be sufficient for obtaining positive results from the electric investigation. The objects of investigation must differ in conductivity from the sphere surrounding them at a ratio up to several hundreds.--W. Ayvazoglou.

EXPERIMENTS ON MODELS CARRIED OUT IN 1927 AND 1928

(In Russian)

By P. Rodionov and N. Sofronov

Comité Géologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 53-71.

The experiments described in this paper are a continuation of experiments carried on by Dedushkevich and reported in the article entitled "Experiments Made on the Electric Fields in a Tank Filled with Water and Provided with with Models of Ore Bodies" given previously in this group of abstracts.

This time the authors tried to come as close as possible to natural onditions under which the ore bodies are usually found, therefore the sizes, eciprocal distribution, and forms of models were chosen accordingly.

A series of experiments in tanks was made in order to establish the nfluence of ore bodies upon the distribution of the current:

1. In case of a system of parallel bodies without inclination.

2. With regard to the thickness (magnitude) of the ore body.

3. In case of a system of inclined parallel bodies.

4. With regard to the depth of an ore body.

5. Concerning the position of an ore body with regard to the electrodes.

The results of the experiments are given in a series of diagrams and ables.--W. Ayvazoglou.

DEPTH ATTAINABLE BY POTENTIAL METHODS OF ELECTRICAL EXPLORATION

By Conrad and Marcel Schlumberger

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 315, 1930, pp. 1-9.

The object of this paper is to clarify the idea, so important when xploring by potential methods, of the depth of investigation attainable by lectrical measurements. After defining, with some precision, the term "depth f investigation" in geophysics, the authors show how it is possible to regulate this depth in potential methods and to obtain an "electrical drilling" rom surface observations. They consider also the difficulties encountered n deep measurements and indicate how it is possible to reach greater depths han those having an industrial interest.--Authors' abstract.

ELECTRICAL STUDIES OF THE EARTH'S CRUST AT GREAT DEPTHS

By Conrad and M. Schlumberger

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 315, 1930, pp. 10-16.

The authors' experiments at Vitré in 1928 should be considered as nly a first attempt to measure, by surface potentiometric observations, the esistivities of deep-lying formations of the earth's crust. Although the igures obtained give only an order of magnitude, they demonstrate the possiility of solving the problem. It must be noted that a small expenditure of nergy, not over a few hundred watts, suffices to electrify a volume of ground

containing over one million cubic kilometers so as to produce a measurable drop of potential.

The authors are convinced that these studies should be resumed and enlarged, since they are one of the few possible ways of investigating the deep regions of the earth's crust.--Authors' abstract.

ABSORPTION OF ELECTROMAGNETIC INDUCTION AND RADIATION BY ROCKS

By A. S. Eve

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 316, 1929, pp. 1-11.

The main factors by which the possibility of detecting ore underground are determined are summed up by the author in his preface to the article as follows:

1. The depth of the ore beneath the surface.

2. The magnitude of the conducting ore body.

3. The excellence of the conductivity of the ore body as compared with that of the surrounding strata.

4. The frequency of the alternating current.

5. The loss of effect of absorption, due to the properties of the strata that overlie the ore body and extend to the earth's surface. This absorption depends upon: (a) The frequency of the alternating current, (b) the conductivity of the strata, (c) permeability of the strata and (d) their dielectric constant.

In the first part of this article the author gives a brief summary of theory on radiation waves; tables showing (1) the penetration for different frequencies, and (2) the depth of penetration of radio waves and a diagram (penetration of radio waves in earth, showing thickness in meters to half value) are added. The second part of the paper describes the experiments carried out under the joint auspices of the U. S. Bureau of Mines and the Geological Survey of Canada in Mammoth Cave, Kentucky, in June, 1929.

A brief note of the work given by the author, reads as follows:

> The Mammoth Cave was selected by Dr. F. W. Lee on account of the entire absence of metallic conductors. The entrances were far removed from the stations selected for research. The exits were water sealed by the Echo River. The overburden consisted of horizontal layers of sandstone and limestones about 300 feet thick. The resistances of these materials were determined in place by the one-electrode probe method. The limestone had a resistivity of about 100,000 ohm-cm. and the sandstone of about 200,000 ohm-cm.

In River Hall, 300 ft. beneath the surface, we received Morse signals from about six long-wave stations bearing N. 65 E. Using a long horizontal antenna (300 ft.) we also received audible broadcasting of speeches and music from a loud speaker. The sending stations were Cincinnati (429 m., 700 kc.) 200 miles away N. 36° E.; Louisville (366 M., 820 kc.) 90 miles away S. 10° W.; and Nashville (461 m., 650 kc.) 100 miles away N. 36° E. These signals unquestionably came through the rocks. Horizontal and vertical loops were placed on the surface of the ground and were stimulated with alternating current of frequencies varying, by steps of 10, from 20 to 110 kc. The received voltage in the coils immediately beneath in the cave 300 ft. below was measured in microvolts, and the superiority of the lower frequency, and of the longer wave length was confirmed.

Finally audiofrequency (500 cycles) alternating current (2.3 amp.) was passed round a 10-turn loop (100 ft. diameter) of insulated wire resting on the earth's surface.

With a receiving coil and head-phones, without amplification, it was possible, 300 ft. underground, to find the point under the center of the loop, thus verifying our survey of the cave. On traversing the cave with the coil we were able to detect the effects of the loop 800 ft. away horizontally, so that the electromagnetic effects were passing through 900 ft. of rock.

The author expresses the desire that the work which so far may be considered of a pioneer character only, be continued.--W. Ayvazoglou.

MAPPING OIL STRUCTURES BY THE SUNDBERG METHOD

By Theodor Zuschlag

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 313, 1930, pp. 1-16.

The basic principle of electromagnetic prospecting in its applica-
on to geologic structure is the measurement of the electromagnetic field
sulting from currents set up in strata which, due to their content of saline
lutions, are of high electrical conductivity. This permits the determina-
on of the depth of these strata, and consequently their elevation can be
cided at a sufficient number of points to give their dip and strike and
us determine the form of geologic structure present.

Following a brief nontechnical discussion of the principles involved,
agrams of the electrical indications resulting from typical geological
ructures are given, followed by maps showing the actual results of electri-
l surveys over a salt dome and a faulted area, respectively.

These results are then compared with the evidence derived from drill-
d the electrical prospecting results are shown to be constant with the
ology.--Author's abstract.

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CERTAIN APPLICATIONS OF THE SURFACE POTENTIAL METHOD

By Warren Weaver

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 68-87.

This is a report on the work of the author on surface potential methods. General principles of the measurements, as well as the interpretation of the curves, are explained. Diagrams and one table showing the per cent of saturation effect for various ratios of conductivities are added.--W. Ayvazoglou.

RECENT RESULTS IN ELECTRICAL PROSPECTING FOR ORE

By Hans Lundberg

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 87-125.

An outline of a general knowledge of the methods and principles involved in preparing and interpreting results obtained in the field is given. Method of electrical prospecting illustrated by a series of diagrams is discussed, and the apparatus and operations are explained. Essentials of the success of electrical methods in serving the mining industry are given as follows: (1) Methods developed to such a degree that the properties of electrical and electromagnetic fields can be correctly determined; (2) knowledge of the strength and character of the influences thereon of ore bodies; (3) experience in interpreting the results; and (4) knowledge of geology.

In the second part of the article Lundberg discusses a few results from different districts in the light of local geology and conditions. The results of surveys in the following districts are mentioned:

1. Survey in the zinc-lead district in the upper Mississippi Valley. Conclusion: The results obtained in this district can not be considered entirely satisfactory, the main difficulty being the low conductivity of the ores.

2. Survey in the Southwest. Conclusion: Conditions for electrical prospecting are limited.

3. Survey in northern California. Conditions favorable for electrical prospecting; some surveys using electromagnetic methods have been carried out.

4. Survey in British Columbia. In general the conditions are favorable, although the topography often is very rough.

5. Survey in Coeur d' Alene district. Conditions generally favorable for electrical prospecting as the veins carry a sufficient amount of conducting sulphides.

6. Survey in northern Manitoba. Electromagnetic methods were used. accuracy of the survey was well checked by diamond drilling conducted erwards.

7. Survey in northern Ontario. Electrical prospecting has been cuted in the Sudbury Basin and tried out in the Cobalt district.

8. Survey in Rouyn district, northern Quebec. The conditions looked first sight ideal for electrical prospecting, but in working in the district tain adverse conditions became evident.

9. Prospecting in Newfoundland. Conclusion: The value and useful- s of electrical prospecting has been abundantly proved in this district, it is doubtful whether here the ore bodies would ever have been located hout this method.--W. Ayvazoglou.

SOME APPLICATIONS OF POTENTIAL METHODS TO STRUCTURAL STUDIES

By E. G. Leonardon and Sherwin F. Kelly

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 180-199.

The authors present briefly some examples of the practical applica- n of the potential methods to geological studies. The examples are chosen m a number of problems solved in the field.

Fundamental points are briefly stated before the field operations l interpretations are described. The authors draw the conclusion that the ried problems discussed in this paper show that it would be erroneous to sume that the potential methods are limited to the search for metallic ores. e field of applicability in structural work is at least of equal importance. e results obtained prove that the method has passed from the experimental age to the realm of practical use.--W. Ayvazoglou.

ELECTRICAL PROSPECTING APPLIED TO FOUNDATION PROBLEMS

By Irving B. Crosby and E. G. Leonardon

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 199-211.

This article presents results of electrical prospecting to determine e depth to rock at various points obtained for the preparation of a contour p showing the bed-rock surface and outlining the buried gorge in the vicinity the site of a large dam on the upper Connecicut River. The results of ectrical determinations directly checked by the drill are shown in a table.

Five out of the 10 determinations are accurate within 5 per cent or ss, three within 20 per cent, and two are bad; the errors of the latter are plained by the authors as due to special conditions.--W. Ayvazoglou.

I.C.6287.

DISCOVERY OF SALT DOMES IN ALSACE BY ELECTRICAL EXPLORATION

By G. Carrette and Sherwin F. Kelly

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 211-221.

The purpose of the work carried out by the authors in the Oligocene potash basin of Alsace consisted of supplementing by an electrical survey the geological data collected thus far. Salt domes, absolutely unknown in that region heretofore, were established, and two of them, one near Meyeheim and another near Hettenschlag, were actually outlined.

In this paper the authors indicate the stratigraphic and structural conditions of the area where these salt domes were found, discuss the results of the electrical survey which led to the location of the domes, and indicate the new geological outlook which such a discovery suggests.--W. Ayvazoglou.

UEBER DAS GRUNDPROBLEM DER ANGEWANDTEN GEOPHYSIK UND DEN ELEKTRISCHEN NACHWEIS VON ERDÖL

(ON THE FUNDAMENTAL PROBLEM OF APPLIED GEOPHYSICS AND THE ELECTRICAL METHOD OF PROSPECTING FOR OIL)

By H. Lowry

Die Naturwissenschaften, vol. 15, 1927, p. 921.

The guiding idea of Lowry, a scientist well known by his works on dynamic methods of prospecting, is expressed in this article as follows:

"I think that not cooperation but, on the contrary, emancipation from this cooperation--that is, emancipation from geology--is the task of applied geophysics. Only in this case will it be possible to expand the investigation to those extensive domains for which there exist no geological maps or only very poor ones, that is, to those domains in which geophysical investigations are most needed."

His further conclusion is that a detailed analysis of deposits in dry areas can be made by use of the method of electric oscillations. Without taking into consideration the fact that the method of electric oscillations is not yet sufficiently worked out and proved so as to be of value for practical use, the fundamental idea of the author presents a certain extreme by which applied geophysics is deprived of its theoretical and practical basis. All the assumptions obtained by geophysical measurements are closely connected with geology because the main difficulty of geophysical methods, which is based on the Newton-Gauss theory of the potential, consists in the multiplicity of interpretations that can be given to the results of measurements of the distribution of the physical properties on the surface of the earth's crust. In order to reduce this multiplicity of interpretations a knowledge of the geological structure of the area under investigation, as well as the possibility of geological interpretation of the results of geophysical measurements, is

ispensable. The author himself considers that the "reduction of the multi-city of interpretations to a series of cases important in practice" is the damental task of the work and tries to solve this problem in a general way. hough the aid of geology may be especially useful in single cases when all individual particularities are taken into consideration.

These standardized cases are, in the opinion of the author, the fol-ing: When above the antenna (oscillator) situated on the ground there are the sphere of its action: (1) Dry rocks, (2) an oil horizon, (3) a reservoir sweet water, (4) of salt water, or (5) an ore body. In the last three cases is supposed that the waters or ore bodies have a horizontal position and are ered with dry over-burden; the terrain is supposed to be a "Tafelland" lateau). The physical characteristics of these five cases are given in the llowing table:

	1. Dry rocks	2. Horizons Impregnated with oil	3. Rocks carrying sweet water	4. Rocks carrying salt water	5. Rocks containing ore
electric constant ε	7	$7<\varepsilon_2<80$	80	80	<80
nductivity σ	10^{-3}	10^{-3}	10^{-8}	10^{-11}	10^{-13}

The enumeration of these possible cases show their incompleteness, sufficiency, and dependency on a geological diagnosis.

The author declares that by measuring at one point the natural fre-ency (λ - Eigenfrequenz) and the time damping (Zeitliche Dämpfung - δ) the estion of which of the five configurations is under the surface can be de-rmined directly. The results of the measurements expressed in the form of ints with relation to the system of coordinates λ, δ, are distributed on ur curves (hyperbola) corresponding to the cases 2 to 5; these curves inter-ct in one point, the latter corresponding to configuration one. The points itside of the curves are not interpreted by the author. The possibility of ny results is, in the opinion of the author, not important from the practical iewpoint and may only cause the omission of the deposit.

Based on his method the author thinks it possible to go over from the lk analysis of the earth's crust (rocks $\sigma = 0 - 10^{-3}$; water, ore $\sigma = 10^{-8}$ - (13) to the detailed analysis according to the above mentioned-method, the in value of which consists in the possibility of prospecting for oil in dry gions. The method can not be used in case of wet ground and so far has theo-tical value only. The practical application of this method is desirable.--

Gorsky.

5. RADIOACTIVE METHODS

UEBER VERSUCHE MIT DEM ELEKTRONENZÄHLROHR

(ON THE EXPERIMENTS WITH AN ELECTRON TUBE-COUNTER)

By A. K. Das and K. Wölcken

Physikalische Zeitschrift, vol. 31, No. 3, 1930, pp. 136-139.

In the first part of the article the authors describe the tube-counter and note the experience obtained with regard to the manufacturing of it

In the second part the results of the experiments with Ra- γ-radiati are given. The values do not differ much from those published by some other authors.

Tables showing the determination of the sensitivity of the tube-counters and the absorption of Ra- γ-radiation by lead are given. The dependence of the intensity of radiation with regard to the distance is shown.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

THE INTERNAL TEMPERATURE OF THE EARTH'S CRUST

By Frank M. Gentry

Science, vol. 70, No. 1,814, 1929, pp. 332-334.

Taking into consideration that the linear gradient of 1° F. in 55 feet is not satisfactory because it leads to large errors at even shallow depths, and that Kelvin's equation, although of considerable theoretical background, does not take account of internal heating which may arise from causes other than the original molten conditions (such, for example, as those of radioactivity, chemical activity, etc.) Gentry discusses in this article the possibility of obtaining equations which would represent the average temperature gradient of the earth's crust.

According to the author the calculations of temperature in the earth's crust made with equations derived by him check exceedingly well, on the whole, with the temperature measurements that have been made by Van Orstrand, Hallock, and others on the world's deepest wells. He adds that, of course, care must be exercised in applying the formulas to oil and Artesian wells, unless the depth of the source of flow be accurately known, for, if the seepage is from a greater depth than the bottom of the well, the temperature of the discharge will be far higher than the computed quantity. On the other hand, if the well taps a fissure short of the bottom, the temperature of discharge will be less than the computed value. Departures from the computed values may be attributed also to variations in the thermal conductivity of the rock.--W. Ayvazoglou.

GEOTHERMAL DETERMINATIONS IN THE WELLS TESP IV IN KALUSZ

(In Polish)

By S. Zych and A. Tabor

Institut de Géophysique et de Météorologie de l'Université de Lwow (Poland). Communications, vol. 3, No. 32, 1928, pp. 886-892.

The authors give a table showing the temperatures at different depths cording to observations made in wells Tesp IV in Kalusz. The figures, as mpared with those obtained in the petroliferous region of Krosno, Boryslaw, d Bitkow are of great interest.

The mean geothermal degree in Kalusz is 31.5 meters, a figure which almost identical with that established by Daly for some other parts in rope.

In comparison with the temperatures in the wells Kornhaber II, in ryslaw an increase of from 2.6° at a depth of 200 meters to 5.6° at 1,000 ters has been observed.

The authors established that, if compared with temperatures measured Paruszowice, in Silesia, those at Kalusz are higher beginning with a depth 770 meters, while at smaller depths the difference is not significant. ofessor Arctowski explains this difference by isostasy.--W. Ayvazoglou.

7. UNCLASSIFIED METHODS.

PROSPECTIONS GÉOPHYSIQUE EN LIMAGNE

(GEOPHYSICAL PROSPECTING IN LIMAGNE)

By M. P. Geoffroy

Annales de l'office national des combustibles liquides, No. 4, July-August, 1929, pp. 617-649.

In this article Geoffroy gives geological interpretations of the data tained from the following geophysical prospections: (1) Gravimetrical pros- ction for oil in the region of southern Limagne carried out by Dr. Pekar, rector of Baron Roland Eötvös Institute in Budapest, at the request of the tional Office of Combustible Liquids, and (2) Electrical prospecting by hlumberger's method carried out between Clermont-Ferrand and Riom.

Gravimetrical work was done during the summer months (July to Septem- r) of 1927 and 1928. One hundred and ninety-eight square kilometers were olored by the Eotvos torsion balance. The number of stations investigated s 144. Both reports are provided with many tables and maps added to this ticle.

Geoffroy utilized besides the results of geological studies made by veral geologists, observations made by himself and data obtained by drilling.

According to the author, geophysical measurements do not always furnish sufficiently decisive arguments. In his opinion this can be explained by the fact that the prospection includes two very distinct problems: The first consists of the determination of geophysical anomalies, and can be solved with great precision. The second, that of geological interpretation, is much less certain, and the results arrived at are often no better than those obtained with ordinary methods of mining, especially those of drilling.

A geological structure of the region investigation is given.--W. Ayvazoglou.

MODERN PROSPECTING

By A. S. Eve

The Times Trade and Engineering Supplement (Canada Section), vol. 25, No. 595, 1929, pp. 58-59.

A brief review of geophysical methods of prospecting (magnetic, electrical, gravitational, and seismic) is given. In conclusion the author says that geophysical methods are in a state of rapid development and evolution that progress is satisfactory and continuous, and that the chief causes of delay are perhaps assignable to the contempt of the sceptics and unbelievers who belittle the results and possibilities, and to oversanguine optimism of those who do not appreciate the difficulties and limitations.--W. Ayvazoglou.

APPLIED GEOPHYSICS, A NEW CONQUEST OF THE MINING INDUSTRY

(In Serbian)

By Vsevolod A. Gorsky

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 4, 1929, pp. 160-167.

Applied geophysics help the solution of the fundamental tasks of mining by rational prospecting of ores and safety of mining work. The purposes of practical application of geophysical methods of prospecting in the mining industry may be summed up as follows: (1) Removal of casual "wildcat" deep borings and diggings; (2) determination of the commercial value of a deposit almost independently of borings; (3) reducing the latter to the minimum necessary for the direct and sure disclosure of the deposit; (4) increasing of accuracy and safety of mining during the process of actual exploitation of the deposit.

The use of geophysical methods in the mining industry requires the solution and application of a series of vital tasks such as: (1) Establishment and active work of governmental institutions for geophysical prospecting by which all the defects of commercial undertakings may be avoided; (2) corresponding enlargement of the programs of mining schools; (3) changes in mining law with regard to a larger freedom in accomplishing geophysical and geological

ospecting based on the fact that this prospecting does not require damage of e earth's surface; (4) close and mutual cooperation of geologists, geophysi-sts, and mining engineers.

Positive qualities and advantages of geophysical methods of prospect-g: (1) Objectivity, quantity, and accuracy of the results obtained by ophysical measurements; (2) application of methematico-instrumental methods;) obtaining of knowledge on the distribution of physical properties of geo-gical strata over a large area; (4) independence of outcrops and an exclusive ssibility of application in the regions covered with alluvium; (5) economy boring and trenching and in the possibility of a correct distribution of pense in conducting the above; (6) cheapness as compared with deep boring and tter results; (7) applicability for quick, and systematic investigations on a rge scale of large areas; (8) increasing the accuracy in determining the obable geological structures and possibility for drawing conclusions based analogy.--Author's abstract.

THE INSTITUTE OF SURVEYING OF MINES AND GEODESY AT THE UNIVERSITY IN LUBLIANA

(In Serbian)

By Vsevolod A. Gorsky

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 9, 1929, pp. 394-403.

A statement of the organization and work of the institute is given. e purpose of the institute consists also of the study and application of ophysical methods of prospecting. The possibility of a productive and easily fectuated application of these methods in Yugoslavia is discussed.--Author's stract.

LA PROSPECTION A DISTANCE DU SOUS-SOL EST-ELLE POSSIBLE?

(IS THE PROSPECTION OF THE SUBSOIL AT A DISTANCE POSSIBLE?)

By Jules Henri

Le Nord Carbonnier, Lille, No. 5, April 12, 1929.

This article may be of interest, as it serves the purpose of distort-g the nature and tasks of geophysical methods of prospecting and diverting e attention of mining organizations to the unscientific or quasi scientific, intastic methods which to a certain degree may be compared with the "divining d." The author propagates the use and discusses the tests and theories made J. Jeannet ("Radioscopy"), Abbe Bouly ("Radies-thesie", and Schermuly "Polarization"), which do not much differ from the problematic methods pro-osed by Pastor ("Radioemanation"), H. Mayer ("Vibration of ether"), and others.

Scientific and applied geophysics must be on guard and must protect emselves against these questionable methods which may throw a shade upon

scientific and useful methods. The mining organizations must be warned against working with persons and organizations using these or similar methods.--V. Gorsky.

GEOPHYSICAL METHODS OF PROSPECTING

(In Serbian)

By D. V. Frost

Technichki List (Technical Paper) No. 1, January, 1928, Zagreb, pp. 6-9.

The author gives a brief review of the nature and sphere of application of geophysical methods of prospecting.--V. Gorsky.

GEOPHYSICAL AND GEODETIC MEASUREMENTS IN THE PRIBRASH MINES

(In Bohemian)

By F. Cehura

Comptes rendus de 1-er Congrès des géographes et ethnographes slaves. Prague, 1926.

The author reports the magnetic, gravitational, seismic, geothermal, and other observations made at various times by Sterneck, the author himself, and others in the Pribrash mines. The results of these observations are given.. V. Gorsky.

GEOPHYSICAL PROSPECTING IN 1929

By Donald H. McLaughlin

Mining and Metallurgy, vol. 11, No. 277, 1930, pp. 26-28.

In this article McLaughlin gives a summary of geophysical prospecting work accomplished in 1929 which, in his opinion, is making encouraging progress toward finding its proper place and function in engineering and geological practice. New devices have been tried out, instruments and technique have been improved, and the methods of application to commercial problems have been increas in many ways within the last year. Different methods of prospecting are examined and the lines of their application discussed. In the last section of the article McLaughlin considers the question of the proper training for young men who plan to follow geophysical prospecting, as this is still a debatable subject and is yet to be solved in the best way.--W. Ayvazoglou.

GEOPHYSICAL EXPLORATION FOR ORES

By Max Mason

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 9-44.

A brief outline of the basic problem of physical exploration is given d the methods by which practical work may be carried out are mentioned.

A critical valuation and understanding of the real nature of these thods, as well as the means by which practical methods are evolved, are dis- ssed in this article under the following headings: (1) The physicist's work;) mathematics applied to detecting ores; (3) how the physicist proceeds; (4) e of models; (5) detectability by electrical method -- four factors; (6) pth frequently overstated; (7) a practical rule; (8) difficulties of inter- eting results the great obstacle; (9) economic aspects; (10) the cost of pros- cting; (11) no physical method detects ore, and (12) underground exploration attractive field.--W. Ayvazoglou.

GEOPHYSICS AND THE MINING ENGINEER

By Allen H. Rogers

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 44-51.

Geophysical prospecting methods have become an important factor of ssistance to the mining engineer in solving his most difficult problem--that finding the ore. Contents of the article: (1) Help in finding the ore;) symptoms of presence of ore; (3) principles of geophysics; (4) application geophysical methods; (5) cost of electrical prospecting.--W. Ayvazoglou.

DAS METEROOLOGISCHE OBSERVATORIUM ZU ANGORA

(THE METEROLOGICAL OBSERVATORY IN ANGORA)

By A. Rethly

Gerlands Beiträge zur Geophysik, vol. 24, No. 4, 1929, pp. 381-383.

The author, who at the request of the Turkish government took charge the organization of meteorological service in that country, describes the rection of a new meteorological observatory near Angora. The geographical sition of the observatory is as follows: Longitude east from Greenwich 32° 3'; north latitude 39° 58'; above sea level 880.8 meters.--W.Ayvazoglou.

GEOPHYSICAL TESTS AT BENDINGO (VICTORIA)

Editorial note

Industrial Australian and Mining Standard,
vol. 83, No. 2,128, 1930, p. 75.

The New Red, White, and Blue Co., Bendingo (Victoria), has reported that the geophysical tests made by S. Anderson have indicated the presence of auriferous formations at a depth of 170 feet, and above the 380-foot and 640-foot levels. Work on the reef over the 690-foot level disclosed gold. Mr. Anderson's tests were carried out chiefly in the south part of the property, where a large area of unworked ground is available. The reefs indicated can be reached by present levels from the south shaft. The spurry formation at 170 feet will be examined by the company. Mr. Anderson will make a geophysical survey of the Ironbark and Hercules mines, and will later carry out some tests on the Maldon field.

LOCATION OF SALT DOMES BY GEOPHYSICAL METHODS IS SUCCESSFUL ON GULF COAST

Editorial note

Oil Field Engineering, vol. 7, No. 1, 1930, pp. 44-46.

The success in locating salt domes almost exclusively by geophysics since 1925 is mentioned, and the definite results obtained on the Gulf Coast are given. Up to the present the seismic method and torsion balance have been the only geophysical methods credited with salt dome discoveries in this region. Of the total of 158 salt domes, 68 are reported to have been located without the aid of geophysics, 20 by the torsion balance, and 70 by the seismic method. Of a total of 80 domes tabulated by the Department of Conservation of the State of Louisiana for the coastal region of that State, 62 were discovered by geophysical methods (55 by the seismic method; 4 by the torsion balance, 2 by the seismograph and torsion balance, and 1 by the geophone and torsion balance) and only 18 by drilling.

As the depths at which geophysical measurements are effective are matters of interest, some of the depths determined by drilling are given in the table below:

	Top of cap, feet	Top of salt, feet
Black Bayou	887	1,709
Bayou Boullion	1,000	1,645
Starks	1,299	2,218
Sorrento	1,617	2,785
East Hackberry	3,254	3,487
Napoleonville	4,013	6,066

A map of Louisiana showing productive and nonproductive salt domes, as well as oil and gas fields, is added.--W. Ayvazoglou.

GEOPHYSICAL EXPLORATION OF THE EGYPTIAN RED SEA COAST

Editorial note

The Petroleum Times, vol. 23, No. 573, Jan., 1930, p. 10.

The Egyptian Ministry of Finances has arranged with the London Geo-
hysical Co. to examine certain points on the Red Sea coast line. Seven Ger-
an experts equipped with the latest scientific apparatus have left for Alex-
ndria from where the Government vessel "Abdul Monain" will take them to the
amp of Abou Shaar.

8. GEOLOGY

HYPOTHESES ON THE DEVELOPMENT OF THE EARTH

By B. Gutenberg

Journal of the Washington Academy of Sciences,
vol. 20, No. 2, Jan., 1930, pp. 17-25.

In a brief sketch Gutenberg gives an explanation of the evolution of
he earth on the basis of forces that must be expected according to the theory,
uch as: (1) Chemical forces and gravity, (2) cosmical forces, (3) forces
aused by the deviation of the earth's crust from hydrostatic pressure, (4)
orces caused by the cooling of the earth and the crystallizing of the matter
n the earth's interior, (5) movements of masses caused by erosion and sediment-
tion, (6) "Polflucht" forces (forces which strive to move the continents
gainst the equator), and (7) stresses caused by movements of the earth's crust
elative to the axes of the earth. According to the author the explanation is
n good agreement with a great many observations.

A fuller explanation of the hypotheses on the development of the earth
s given in the "Handbuch der Geophysik," vol. 3, of the same author.--W.
yvazoglou.

GEOLOGY OF THE PETROLIFEROUS DISTRICT OF MAJEVICA IN S. H. S.

(In Serbian)

By M. Luković

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical
Industry), Belgrade, vol. 1, No. 2, 1929, pp. 49-58.

The mountainous region of Majevica, in the southeastern part of
osnia, is covered mostly with Tertiary formations and is rich in outcrops of
atural gas, salt and sulphur springs, and also has many indications of oil
onnected with the Eozoic deposits. Based on his own observations, Lukovic gives
stratigraphic and tectonic description of the region which resembles, c
erning the geology, the Carpathian paleogene oil zone and which, owing
tructure, is the most promising district for finding oil in Yugoslavia.

The region must be considered to be very interesting for geophysical prospecting.--V. Gorsky.

GEOLOGY AND ORE DEPOSITS AROUND RASKA AND NOVI PASEER

(In Serbian)

By M. Lukovic

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 10, 1929, pp. 435-452.

The geological investigation made by Lukovic concerns a small area of the large ore district extending from Srebrnica in Bosnia to Yaniv and Novi Brd near Pristina in northern Macedonia. The mining development in this district, principally by English and French capital, is becoming very intensive.

The district described has many outcrops and deposits of chromite and magnesite mixed with serpentine, galena containing silver, sphalerite, pyrite, arseno-pyrite, and chalko-pyrite accompanied by quartz in connection with andesites and trachytes of the Miocene and Pliocene epochs; there are besides some unimportant deposits of Senonian coal.

Lead-zinc deposits belong to the well-known type of deposits formed from the hot mineral solutions at medium and small depths; they may be of commercial value. The electrical method of prospecting would probably be successful.

Means of communication are satisfactory, and most of the outcrops and old works are situated close to the just completed Kralievo-Raska railway line. --W. Ayvazoglou.

9. NEW BOOKS

rroth, A. Schweremessungen (Gravity measurements). 70 pp., 46 figs. From: Handbuch der Physik (Manual of physics), published by H. Geiger and K. Scheel. Vol. 2, Berlin, Julius Springer, 1928, pp. 416-486. Contents: (1) Determination of the field of gravity of the earth in general. (2) Measurements of the direction of gravity. (3) Measurements of the intensity of gravity with pendulums. (4) Measurements of gravity gradients (torsion balance). (5) Disturbances of the force of gravity caused by the sun and the moon. (6) Some other relations to the force of gravity.

wie, W. Isostasy. XIV and 275 pp. with 39 figs. New York, E. P. Dutton and Co., price $5. Contents: (1) The development of the isostatic theory. (2) Quantitative test of isostatic theory. (3) Assumptions underlying computations of isostatic effect. (4) Isostatic condition of earth's crust under various classes of terrain. (5) Some geodetic and geophysical deductions from the proof of isostasy. (6) Some phases of isostatic adjustment. (7) The influence of isostasy on geological deductions. (8) Processes involved in crustal and subcrustal movements. (9) Proposed theory, in harmony with isostasy, to account for major changes in the elevation of the earth's surface.

ve, A. S., and Keys, D. A. Applied Geophysics in the Search for Minerals. Cambridge University Press, London, 1929, 244 pp. Illustrations. $4.50

tenberg, B. Handbuch der Geophysik. Band 4, Lieferung 1, Berlin, Gebr. Borntraeger, 1929, 298 pp. Contents: Theory of earthquake waves; observations; disturbances of the ground.

cker, O., and Meissner, O. Irdische Schwere (Terrestrial Gravity), 33 pp. 44 figs. From: Handbuch der Physikalischen und Technischen Mechanik (Manual of physical and technical mechanics), edited by F. Auerbach and W. Hort. Vol. 2, No. 1, Leipzig, Johann Ambrosius, Barth, 1928, pp. 148-181. Contents: (1) Level equipotential surfaces and gravity. (2) Experimental determination of gravity. (3) Mean density of the earth and the gravity constant.

effreys, H. The Earth, its Origin, History and Physical Constitution. 2nd ed. XI and 346 pp. with 16 figs. and 3 tables. Cambridge University Press, 1929. Price: 20 sh. Contents: Introduction. (1) The nebular hypothesis of Laplace. (2) The tidal theory of the origin of the solar system. (3) The origin of the moon. (4) The resisting medium. (5) The age of the earth. (6) Seismology: General considerations and structure of the upper layers. (7) Seismology: The earth's interior. (8) The thermal history of the earth. (9) The equation of motion of an elastic solid with initial stress. (10) The bending of the earth's crust by the weight of mountain. (11) The theory of isostasy. (12) The figures of the earth and moon. (13) The variation of latitude and the bodily tide. (14) Tidal friction. (15) The origin of the earth's surface features. Appendix: The planteisimal hypothesis. Jean's theory. The relation of mathematical physics to geology. Theories of climatic variation. Empirical periodicities.

I.C.6287.

Kirsch, G. Geologie und Radioactivität (Geology and radioactivity). VIII and 214 pp., 48 figs. Berlin, Julius Springer, 1928. Price: Stitched, R.M. 16; bound, R.M. 17 - 60. Contents: Introduction and brief summary on radioactivity. (1) Distribution of radioactive substances. (2) Radioactive substances as sources of energy. (3) Determination of age based on radioactivity.

Kohlrausch, K. W. F. Handbuch der Experimentalphysik (Handbook of experimental physics). Vol. 15, Radioactivity; X and 385 pp., 285 figs. Leipzig, 1928; Akademische Verlagsgesellschaft m. b. H. Price: stitched, R. M. 79; bound, R. M. 81. Contents: (1) Preface. (2) β -radiation. (3) γ -radiation. (4) α -radiation. (5) Reflection-radiation. (6) Various effects of radiactive radiation. (7) Laws of radioactive changes. (8) Methods of measurements of radioactivity. (9) Radioactive substance. (10) The atomic nucleus.

Maurain, Ch., Brazier, C. - E., Eble, L., Labrouste, H., Salles, Ed. Données Numerique de Physique du Globe (Numerical data on the physics of the earth). VII and 60 pp. Paris, Gauthier Villars et Cie., 1928. Price: stitched, 34 fr.; bound, 50 fr. Contents: (1) Form of the earth; Density; Gravity. (2) Seismology. (3) Terrestrial magnetism. (4) Atmospheric electricity. (5) Aurora polaris. (6) Radioactivity. (7) Solar radiation; atmospheric and terrestrial. (8) Meteorology.

Meyer, St., and Schweidler, E. Radioaktivität (Radioactivity). Chapter VII: Radioactivity in geophysic and cosmic physic. 2nd ed., enlarged and revised. Leipzig and Berlin, B. G. Teubner, 1927, pp. 546-624. Contents: (1) Radioactivity of minerals and rocks. (2) Radioactivity and the temperature of the earth. (3) Determination of age of minerals and rocks. (4) Radioactivity of waters. (5) Radioactivity of the atmosphere. (6) Radioactivity of the ground air. (7) The ionization in closed vessels and the penetrating radiation. (8) Participation of radioactive radiation on the ionization of the atmosphere. (9) Cosmic radioactivity.

Mitteilungen der Badischen Geologischen Landesanstalt (Report of the Geological Institution of Baden). Herausgegeben im Auftrage des Finanzministerium. Vol. 10, No. 1, Freiburg i. B. Verlagsbuchhandlung Herder and Co., 1928, 233 pp., 13 figs., 17 tables. Price: stitched, R. M. 15. Contents: Haseman, W.: Geology and tectonic of the vicinity of Eberbach in Odenwald. Holst, Dr. H.: Torsion balance measurements in Schauinsland near Freiburg i. Br. and their geologic interpretation.

Müller - Pouillets. Lehrbuch der Physik (Manual of Physics). pt. 1. Physics of the earth. 11th ed., vol. 5, Braunschweig, Friedr. Vieweg and Sohn A.-G., 1928, XVIII and 840 pp., 341 figs., 7 tables. Price: stitched, R.M. 49. Contents: Mechanics and thermodynamics of the earth body; Gutenberg: The development of the earth; Observations concerning gravity and isostasy; Movement of the axis of the earth and polar movements; Tides of the earth body; The form of the earth; Density of the earth and the pressure inside of the earth; The constitution of the earth. Wiechert: Theory of gravity; geoid, geodesy.

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ssel, K. Experimentelle Methode der Vorausbestimmung der Gesteinstemperatur im Innern eines Gebirgsmassivs (An experimental method of the predetermination of rock temperature inside of a mountain massif). München und Berlin, Verlag von R. Oldenbourg, 1923, 58 pp., 12 + 11 figs., 4 tables and 15 numeral tables. Price: stitched, R. M. 10. Contents: Introduction. Electrical experimental method for the predetermination of rock temperature inside of the mountain massif. (1) Brief summary on the method and results of it applied in the tunnel areas of the Simplon and Gotthard. (2) Details concerning the arrangement and execution of the experiments. Appendix: Device for the measurement of curves constructed by Pressel and Riefler.

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eberg, August. Geologische Einführung in die Geophysik. (Geological introduction to geophysics). Iena, Gustav Fischer, 1927, X and 374 pp. with 260 figs. and one colored map. Price: bound, R.M. 19. Contents: Preface. (1) The earth planet. (2) Internal structure and physical conditions of the earth body. (3) Position of the earth in the universe and the process of the development. (4) The weight of the earth. (5) Earth magnetic and similar phenomena. (6) The magnetic proceedings. (7) The tectonic proceedings. (8) The seismic proceedings. (9) Earthquakes.

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DEPARTMENT OF COMMERCE — BUREAU OF MINES

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Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

EIN NEUER VIERPENDELAPPARAT FUER RELATIVE SCHWEREMESSUNGEN (A NEW FOUR-PENDULUM APPARATUS FOR RELATIVE GRAVITY MEASUREMENTS)

By. O. Meissner

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 1-12.

A new four-pendulum apparatus with fundamental improvements is described. In order to create an instrument answering the demands for increas accuracy of observation and of value for work in the field, thorough considera was given to all developments in the theory of pendulums, the results of resea es on materials, and present possibilities for application of physical methods measurement. Photographs of the apparatus and a series of diagrams illustrate the article.--Author's abstract, translated by W. Ayvazoglou.

GEOPHYSIKALISCHE MESSUNGEN UNTER TAGE (UNDERGROUND GEOPHYSICAL MEASUREMENTS)

By O. Meissner and F. Wolf

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 13-21.

The authors discuss the possibility of applying geophysical methods to the problems of mining. General rules for making torsion-balance measureme in mines are given. Vectors for a special case are calculated theoritically a the vectors are drawn.

In order to make the Hecker's torsion balance suitable for measureme in mines, the constants of this instrument were changed as follows: The total length of the beam of the balance was made 21 centimeters; the weight, 21 grams the difference between the heights of the weights, 36 centimeters; the torsion constant, 0.32; and the length of the filament,(W), 31 centimeters. The instrument was mounted on an adjustable foot allowing the center of gravity of the balance to be changed by 1 millimeter. The accuracy of measurement of the gradient was ± 2.5 E; this is considered sufficient for underground measurements.

Theoretical curves, shown in diagrams, have proved to be useful in practice, and the small torsion balance gave sufficiently good results. within the admissible limits of errors equal to ± 3 E.

The last part of the article gives the results of torsion-balance measurements carried out in a salt mine.

In order to complete the problems the authors find it necessary to use some other geophysical methods (magnetic, seismic), in addition to the torsion balance measurements. — W. Ayvazoglou.

BESTIMMUNG DER TEMPERATUR - UND DER LUFTDICHTEN-KONSTANTEN VON SCHWERKRAFTPENDELN NACH DEM ZWEIPENDELVERFAHREN

(DETERMINATION OF TEMPERATURE CONSTANTS AND AIR-DENSITY CONSTANTS OF GRAVITY PENDULUMS BY THE TWO-PENDULUM METHOD)

By H. Schmehl and W. Jenne

Zeitschrift fuer Instrumentenkunde, vol. 49, No. 8, 1929, pp. 396-406.

The authors discuss the two-pendulum emthod of observation and reduction, s this method differs in many points from that generally used. The apparatus is escribed, the procedure of observations explained, and the conditions are mention-d under which the observations are carried out; the results of observations are iven in tables, and the proceedings for reduction and adjustment of observations ecessary for determination of temperature constants and air-density constants are onsidered. The authors show that the determination of the temperature constants nd density constants of gravity pendulums by the two-pendulum method, if compared ith the usual one-pendulum method, offers the following advantages:

1. The time of observation is reduced one-half.

2. The accuracy of the determination of the constants is increased.

3. The reduction work is simplified.

The correction of observations according to the coincidence moments nstead of periods of oscillations is another important advantage. -- W. Ayvazoglou.

SUBTERRANEAN STRUCTURE OF THE TAKAMACHI OIL-FIELD REVEALED BY GRAVITATIONAL METHOD

By Motonori Matsuyama and Hideo Higashinaka

Japanese Journal of Astronomy and Geophysics, vol. 7, No. 2, 1930, pp. 47-81.

The authors describe the results of observations carried out with the "otvos gravity-variometer in the autumn of 1927 in the oil district of Takamachi nddiscuss the subterranean structure as revealed by the observations. Contents f the article:

1. Introduction.

2. Method of observations.

3. Values of the Eötvös quantities.

   (a) The observed data.

   (b) Corrections for topography.

   (c) The normal effects.

   (d) The residual effects.

4. Underground disturbances and anomalies of gravity.

(a) Existence of a fault and its depth.

(b) Some suggestions.

(c) Anomalies of gravity.

(d) Conclusion.

In all, measurements on 21 stations were made; tables are given showing the observed data, topographical effects, and residual effects at these stations.

In the appendix the authors describe the effect of a mass of two-dimensional form upon Eötvös quantities and discuss the possibility of determining the subterranean configuration according to that effect. General formulas are given for faults and dykes derived from simple forms such as: Rectangular prism, triangular prism, quadrangular prism, prism of any form, and cylindrical form. Eighteen figures illustrate the article. -- W. Ayvazoglou.

GRUNDSÄTZLICHE FRAGEN BEI DER BERECHNUNG DER SCHWERKRAFT
(FUNDAMENTAL QUESTIONS IN COMPUTING THE FORCE OF GRAVITY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 85-94.

Geophysics often deal with the problem of computing the gravity acceleration inside of the earth's crust for a point situated near the surface of the earth. Therefore, computation of the force of gravity is a problem which concerns interior space. But as a rule the problem is solved in such a way that the earth's crust is assumed to be a mass formation reduced to a plane, in the exterior space of which the point under investigation is situated; that is, the problem becomes that of the exterior space.

In this article Hopfner examines the question: on what supposition does the method of condensation by computing attraction of masses lead to approximations which may be used for comparison with circumstances offered in nature?

The results of a test investigation brought the author to the conclusion that the condensation of attracting masses is a problem which concerns interior space and therefore can not be solved as a problem of exterior space. -- W.Ayvazo

SUL PROBLEMA DELLE ISOGAMME
(ON THE PROBLEM OF ISOGAMS)

By Arnaldo Belluigi

Reprint from the Gerlands Beitrage zur Geophysik, vol. 20, No. 3/4, 1928, 2 pp.

This article is written in connection with a previous work of the author "Su l'impiego delle isogamme" (on the use of isogams), published in the "Reale Istituto Lombardo di Scienze e Lettere," vol. 61, No. 6-10, 1928. Belluigi shows here how some limitations of the use of isogams may be eliminated, thus making it possible to solve the problem of isogams for a very general case in a quick and accurate way.— W. Ayvazoglou.

LA CORREZIONE TOPOGRAFICA NEI RELIEVI GRAIMETRICI
(GRAVIMETRICAL PROCEEDINGS FOR TOPOGRAPHIC CORRECTIONS)

By A. Belluigi

Ufficio Centrale di Meteorologia e Geofisica, Roma, vol.2, series 3, 1929, 18 pp.

In one of his previous articles, "Semplici e rapidi procidimenti di rrezione topografica" (Simple and rapid proceeding for topographic corrections), blished in the R. Accademia Nazional dei Lincei, vol. 9, No. 8, 1929, Belluigi ived simple formulas and indicated gravimetrical proceedings for topographic rrection, by which the results obtained were not inferior to those attained by d proceedings, in particular those derived by Eötvös and Schweydar. In this ticle the author discusses new formulas and considerations and gives graphs and bles. --W. Ayvazoglou.

ÜBER DEN SCHWEREUNTERSCHIED MÜNCHEN-POTSDAM
(ON THE MUNICH-POTSDAM GRAVITY DIFFERENCE)

By Karl Schütte

itzungsberichte der Bayerischen Akademie der Wissenschaften, vol. 1, Jan. - March, 29, pp. 85-95.

Taking into consideration the importance of the determination of the lative gravity difference between Munich and Potsdam, owing to the fact that the servatory in Munich serves as a reference station for pendulum observations made Bavaria, new observations were carried out from April 25 to June 25, 1928, for mparison with the old, already existing, data.

In this article Schütte examines and compared briefly the results of servations. The article is divided under the following headings: (1) Introduction; (2) Pendulums and their constants; (3) Observations made in 1928; (4) d the constants of the pendulums; and (5) The relative gravity difference, inich-Potsdam. --W. Ayvazoglou.

GRAVIMETRIC METHOD BASED ON USE OF TORSION BALANCE

By. H. W. Rose

The Oil and Gas Journal, vol. 28, No. 45, 1930, pp. 41 and 112.

Rose gives general information on the gravimetric method of prospection d the mathematical theory, and includes a description of Eötvös torsion balance. erations in the field and interpretation of data are discussed briefly. The thor concludes that the degree of success attained by this method will depend on 1) the accuracy and thoroughness of the field survey and (2) the skill and experience applied to the interpretation of results.--- W. Ayvazoglou.

2. MAGNETIC METHODS

MAGNETOMETER STUDY OF THE CADDO-SHREVEPORT UPLIFT, LOUISIANA

By William M. Barret

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 2, 1930, pp. 175-185.

Major disturbances of the vertical magnetic field are associated with the Caddo-Shreveport uplift. The writer presents the relationship between geolo structure and the vertical element. The possibility that well casing and tubing introduce a distortion of the lines of force delineating the field is considered and the similarity of vertical intensity and gravity gradient profiles is sugges The writer offers several hypotheses to account for the areal pattern of the resultant anomalies.— Author's abstract.

ON THE WORK OF THE MAGNETOMETRIC PARTY IN THE REGION OF KRIVOY ROG (In Russian)

By A. Strona

Vestnik du Comite Géologique, vol. 4, No. 10, Leningrad, pp. 20-23.

The discovery of the anomalous zone of Krivoy Rog-Jeltiansk, in 1928, initated the sending of a party to investigate the extension of this zone into district of Kremenchug. It was established that the anomaly continues without interruption and has a mean value of intensity V_a (vertical component) of about 0.1 c.g.s., reaching sometimes a value of 0.27 c.g.s. The party established tha the main anomaly in the district of Kremenchug was unquestionably caused by thi layers of iron deposits; the percentage of Fe in these deposits is to be determ As there were no geological data pertaining to the region, the magnetic investi tions were carried out entirely independent of them.

Another interesting magnetic anomaly was found to the south of the Kremenchug-Poltava railroad line; in this region the intensity V_a reached in so places the extraordinarily high value oqual to 0.567 c.g.s. Tiberg-Thalen's magnetometer was used. An apparatus constructed by Pavlinoff and manufactured in the workshops of the Government Optical Institute was tried also, but proved to be inferior to the Tiberg-Thalen magnetometer, as, in addition to its much higher price ($700), it was only one-fifth as efficient. -- W. Ayvazoglou.

UEBER DEN NACHWEIS VON ANTIKLINALEN UND SYNKLINALEN DURCH ERDMAGNETISCHE MESSUNGEN

(ON THE DETERMINATION OF ANTICLINES AND SYNCLINES BY MEANS OF ELECTRO-MAGNETIC MEASUREMENTS)

By J. B. Ostermeier

Petroleum, vol. 26, No. 10, 1930, pp. 325-326.

Based on an example given in J. G. Sineriz's article "Los Methodos ofisicos de Prospeccion" (Madrid, 1928, pp. 474-476, Lamina XV), Ostermeier cal-lates the maximum anomalies of the earthmagnetic vertical intensity which can be pected over synclines and anticlines if the same difference of susceptibility is mentioned in the example is assumed. The author concludes that the accuracy earthmagnetic measurements of synclines and anticlines increases with the depth the primitive rocks.—W. Ayvazoglou.

PROFILAUFNAHMEN AN EINER ERDMAGNETISCHEN STÖRUNG IN OSTPREUSSEN

(MAPPING OF PROFILES OF AN EARTHMAGNETIC DISTURBANCE IN EAST PRUSSIA)

By F. Errulat

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, pp. 53-58.

Measurements of magnetic disturbance in the region southwest of Pillkallen ere carried out by the author. Schultze's magnetometer No. 18, improved by the dition of some parts from No. 19, was used.

Tables showing (1) the position of the 17 stations, (2) the results of e observations, and (3) the values of disturbances, are given. Diagrams of ofiles between stations 1 and 9 and 1 and 14, are drawn. The position of the lations and the horizontal vectors of disturbance are represented in a figure.— Ayvazoglou.

SULLA CORREZIONE TOPOGRAFICO-MAGNETICA

(ON MAGNETIC CORRECTIONS FOR TOPOGRAPHY)

By Arnaldo Belluigi

ti della Pontificia Accademia delle Scienze Nuovi Lincei, Vol. 82, Session 6, rch, 19, 1929, 10 pp.

The author discusses the problem of topographic corrections by applying gnetic measurements in a region with rough topography. The article deals with heoretical conditions as well as with the practical application of the method in he hilly region of Parma.. Schmidt's magnetic variometer has been used.— Ayvazoglou.

3. SEISMIC METHODS

DIE ERSTEN DICKENMESSUNGEN DES GRONLANDISCHEN INLANDEISES

(THE FIRST MEASUREMENTS OF THE THICKNESS OF GREENLAND'S INLAND ICE)

By Ernst Sorge

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 28-31.

Sorge gives the results of a German expedition to Greenland, undertaken in August, 1929, with the purpose of making measurements of the thickness of the inland ice. The seismic method was employed, and Wiechert's vertical field seismograph was used.

Four stations were selected, and the results of 22 explosions were registered. The thickness of ice was established by the reflection of longitudinal waves from the lower limiting surface of the ice.

A table shows the data obtained. The thickness established varies from 330 meters at 970 meters above sea level, to 1,200 meters at 1,570 meters above sea level. Seismograms and diagrams of longitudinal and transversal waves are added.—W. Ayvazoglou.

WAVE-FRONT DIAGRAMS IN SEISMIC INTERPRETATION

By H. R. Thornburgh

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 2, 1930, pp. 185-201.

Subsurface structure can be established from seismic data by graphical methods based upon wave-front diagrams. The method of construction of these diagrams is shown, and the nature and origin of the important under-layer wave is explained. Coincident time-curves and secondary shotpoints are defined and some applications are illustrated. The diagrams are used to explain some of the simpler seismic rules, and the original determination of simple under-layer structure is illustrated.

The paper is only an introduction to wave-front methods; the principles developed can be applied by experienced seismologists to more complex situations. — Author's abstract.

DIE SEISMISCHE BODENUNRUTE IN HAMBURG UND IHR ZUSAMMENHANG MIT DER BRANDUNG

(THE SEISMIC DISTURBANCE OF THE GROUND IN HAMBURG AND ITS CONNECTION WITH THE SURF)

By H. Mendel

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 32-41.

This detailed abstract was made by H. Schünemann from H. Mendel's work
47 pp. 6 figs. 12 tables, Hamburg, 1929) bearing the same title. Schünemann
xamines the microseismic disturbance of the first order occurring in Hamburg,
r means of voluminous material, concerning the amplitudes and periods, as well
s the possible connection of these two quantities, and especially concerning the
nfluence of the surf movements on the Norwegian coast and in the Bay of Biscay.
he data obtained by Wiechert's horizontal seismograph (V = about 200, T_0 = about
0 sec.) in the years from 1909 to 1913 and from April 1, 1919, to March 31, 1924,
erved as a basis for the determination of the horizontal component of the move-
ent; for the vertical component the records of Wiechert's vertical seismographs
V = about 200, T_0 = about from 4 to 6 sec.) for the last mentioned period were
sed. Maximum amplitudes and corresponding periods were measured every day between
-50 and 7-10 of mean Greenwich time; the mean values of these data, divided into
hree components of the movement as well as into horizontal and vertical components,
re grouped according to the years, months, and decades.— H.Schünemann's abstract
ranslated by W. Ayvazoglou.

ZUR FRAGE DER LAUFZEITKURVEN

(CONCERNING THE QUESTION OF THE TIME-CURVES)

By B. Gutenberg

Zeitschrift fuer Geophysik, vol. 6, No. 1, 1930, pp. 57-64

In connection with Krumbach's article, "Zur Frage der Laufzeitkurven",
ublished in Zeitschrift fuer Geophysik, vol. 5, No. 7, 1929, pp. 303-314 (see
eophysical Abstracts 10), Gutenberg discusses the original sources of error in
stablishing new time-curves, as well as the indications for the difference of
ime necessary for traveling of longitudinal waves during the different earth-
uakes.

In two brief articles, that of Krumbach, entitled "Erwiderung zur
orstehenden Arbeit von Herrn Prof. Gutenberg" (Answer to Professor Gutenberg's
receding Article), pp. 60-62, and that of Gutenberg, "Bemerkungen zu der
orstehenden Erwiderung" (Remarks on the Previous Answer), pp. 62-64, the
uthors express their viewpoints on the question.—W. Ayvazoglou.

THE EFFECT OF SUPERFICIAL SEDIMENTARY LAYERS UPON THE TRANSMISSION OF SEISMIC WAVES

By A. Imamura, F. Kishinouye, and T. Kodaira

ulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929,
p. 471-489.

In this article the authors discuss the results of introducing into
heir studies of seismometry the conception of a surface layer overlying the
ranitic one. Twenty-one shocks, which originated within the network of stations
nder the observation of the authors, out of 65 which shook the Kwanto district
uring 1927, were examined. The authors started their calculations by assuming

the existence of the substrata in this region as established by Proffessor Matuz (granitic layer — depth of the lower boundary = 20 km., the basic layer — dept of the lower boundary = 50 km., and the ultra-basic layer), and worked on the ev uation of the thickness and of the value of K ($K = \frac{d}{t}$ in which "d" is the distanc of the seismic focus from a station and "t" the duration of the preliminary trem at the said station) of the surface layer conforming to the results of observati of these 21 shocks. The results of observations are given in tables and diagra W. Ayvazoglou.

ON THE EARTH VIBRATIONS INDUCED IN SOME LOCALITIES AT THE ARRIVAL OF SEISMIC WAVES

By A. Imamura

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 4 495.

Seismograms may involve, besides seismic waves propagated from the foc to our stations, earth vibrations induced there by means of the seismic waves th arrived. The present article contains some results of analytical study of such earth vibrations.

A figure shows seismograms due to the earthquake of November 6, 1925, near Kasumigaura, which were registered at diluvial ground in Tokyo with an Imam tronometer ($V = 50$, $T_0 = 7$ sec.) and with another similar instrument set up on a rigid pedestal of 16.1 by 11.6 by 4.3 foot size. The pedestal was situated abou 210 meters from the first station, with its upper level lower than the ground level by 4.9 meters. The difference of the earth movements indicated by the sei mograms obtained at these two stations revealed that small earth vibrations of a period ranging from 0.2 to 0.4 sec. were induced in the thin surface layer of th place.

Another illustration reproduces the seismograms due to the deep-seated earthquake (depth about 300 km.) which occurred on June 3, 1929, at 6.34 a.m. of the coast of Sima province. It was registered with instruments, essentially of same type as those previously mentioned, installed at Siotu and Hikata in Kii pr vince, the mutual distance between the two stations being only 4 kilometers. Th ground of Siotu is Paleozoic diabase tuff in formation, whereas that of Kitaka i of the same formation covered with soil of certain depth. It will be noticed th the P-phase is much larger than the S-phase, a characteristic perculiar to earth quakes at such a depth. The duration of the P-phase at both stations was 39.5 seconds.

A specially interesting fact noted in observing such an earthquake at distance, as in the present case, is that the seismic waves emerge almost at rig angles to the earth's surface, and consist for the most part of slow undulations almost free from vibrations of short duration. In fact, the seismograms of both stations are similar to each other, except that the Hikata register involves in addition a series of secondary vibrations of a constant period of about 0.55 sec These secondary vibrations are present only in the P-phase, and are approximatel proportional to the magnitude of the fundamental waves accompanying them. This suggest that they are earth movements induced in the superficial soil layer, poss as plane elastic waves making reflection at the upper and lower boundaries of th layer.

Examination of seismograms obtained during the same earthquake and obined at our seismological stations in the Kwanto district has brought out, as the riods of similarly induced earth-vibrations, the following values:

For superficial soil layer - - - - - 0.2 — 0.3 sec.
For diluvium soil layer - - - - - - 0.4 — 0.5 sec.
For Tertiary soil layer - - - - - - 0.6 — 0.7 sec.

If such a method of estimation be legitimate, then the thickness of e different layers may be worked out. -- Author's abstract.

REGISTRIERUNGEN MIT ZWEI GALITZINPENDELN VERSCHIEDENER PERIODE

(REGISTRATIONS MADE WITH TWO GALITZIN-PENDULUMS WITH DIFFERENT PERIODS)

By B. Gutenberg

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 74-80.

Records of a Galitzin-pendulum with short period installed on the Taunus bservatory started a series of questions, the answering of which was possible only comparison with the records of a similar pendulum with greater period. Therefore, two Galitzin-pendulums with own periods of 2.7 seconds and 19 seconds respectively, were set up on the same pillar. The results obtained are discussed d illustrated by graphs represented on the same sheets. The results may be mmed up as follows:

1. The records of the pendulums were so much different that only in very are cases was it possible to establish that the same components at the same time ere involved.

2. The short-period pendulum showed a better picture of an earthquake iginating at a short distance than the long-period pendulum.

3. In case of remote earthquakes mostly only the direct longitudinal waves ere recorded by the short-period pendulum.

4. The short-period pendulum sometimes recorded the longitudinal waves more uickly than the long-period pendulum.

The author concludes that an investigation of the records obtained by endulums with different periods, owing to the great differences obtained by the eriods used, is desirable. He finds the Galitzin-pendulum suitable for this urpose. -- W. Ayvazoglou.

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UEBER DIE AUSLÖSUNG VON ERDBEBEN DURCH DIE ACHSENSCHWANKUNGEN DER ERDE

(ON THE ORIGIN OF EARTHQUAKES BY OSCILLATIONS OF THE AXES OF THE EARTH)

By R. Spitaler

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 118-129.

Based on observations made of 87 earthquakes, the author shows that a close connection exists between the latitude of a place on the globe and the re spective changes which take place in it at the time of the earthquake. The ear quake is generally preceded by a change of direction of the elastic tension of forces caused by the change of latitude with the tendency to forming the rotati ellipsoid in conformity with the new position of the rotation axis, temporarily producing earthquakes in certain places adapted to them.-- Author's abstract.

LE ONDE MISTE E L'OTTICA DEI RAGGI SISMICI

(COMBINED WAVES AND OPTICS OF SEISMIC RAYS)

By Arnaldo Belluigi

Gerlands Beiträge zur Geophysik, vol. 23, No. 3, 1929, pp. 233-236.

The author generalizes some results obtained by P. Rudzki which conce the existence of combined waves in anisotropic mediums. It seems neces ary to take into consideration in the theory of seismic rays not only the well-known P S waves, but also the P_m and S_m waves ("m" stands for "misto," combined) in orc to bring certain mathematical demands into accord with corresponding experiment demands.-- Author's abstract translated by W. Ayvazoglou.

RESULTATS DES OBSERVATIONS SEISMIQUES ON TCHECOSLOVAQUIE

(RESULTS OF SEISMIC OBSERVATIONS IN CZECHOSLOVAKIA)

By Jos. Plihal

Institut Geophysique National Tchecoslovaque, Bulletin Sismique, vol. 1, 1928, pp. 1-26.

The seismologic, as well as the magnetic service, in Czechoslovakia at the present time concentrated in the "National Geophysical Institute of Cze slovakia." In this article Plihal gives a description of several seismic stati established in this country, their equipment and the results of observations u to the year of 1928. A map showing the situation of seismic stations is added W. Ayvazoglou.

4. ELECTRICAL METHODS

PROSPECTIEREN AUF ÖL MIT ELEKTRISCHEN METHODEN

(PROSPECTING FOR OIL BY ELECTRICAL METHODS)

By Karl Sundberg

Petroleum, vol. 26, No. 10, 1930, pp. 317-324.

Before giving the results of practical work carried out by the author the field, Sundberg discusses the different lines of direction which can be rsued in searching for oil by electrical methods of prospecting:

1. Locating of important structures, such as anticlines and synclines, sed on their good or bad electric conductivity in comparison with the surround- g areas. A brief discussion of the applicability of this kind of investigation given.

2. Searching for oil by electrical methods based upon the assumption at a direct finding of oil is possible owing to its nonconductivity. Practical plication of this case is difficult and can be realized under especially favor- le conditions only.

3. Application of electrical methods of prospecting for oil consisting the investigation of the configuration of the conducting subterranean strata.

The third way of searching for oil is examined in this article. As is method is based on the differences in the electric conductivity of various dimentary layers, the author examines the factors by which the conductivity l determined (sufficiently great difference in the electric conductivity of ngle layers, direction of layers of good conductivity with regard to the geo- gical structure in general, percentage of water in rocks, specific resistance water in the pores). A table showing the volume of pores of various rocks percentage and a table of specific resistances of rocks (in ohms per cubic ntimeter) in case the pores are filled with surface or ground water or with lt water are given.

The second part of the article deals with the description of the inciples of the electrical method, the work in the field and practical results.

Although most of the details of investigations carried out by Sundberg to 1929 (about 2,500 sq. km.) could not be disclosed owing to special agree- nts made with the companies for which the author worked, the results of elec- ical prospecting for oil in the region of Lanzendorf, near Vienna, are given this article. A good conformity of geologic and geoelectric surveys was ob- ined and even more details were disclosed by the latter. A map of Lanzendorf owing the results of both the investigations is added.--W. Ayvazoglou.

AMPLIFICATORI GEOMETRICI DI PICCOLO DEFORMAZIONI DI

LINEE DI CORRENTE IN UNO SUOLO ARTIFICIALMENTE ELETTRIZZATO

(GEOMETRICAL AMPLIFICATION OF SMALL DEFORMATIONS OF CURRENT LINES IN AN ARTIFICIALLY ELECTRIFIED GROUND)

By Arnaldo Belluigi

1929, 4 pp.

In this article Belluigi explains the theory and derives formulas fo a geometrical "amplifier" by which small deformations of the current lines in an artificially electrified ground can be discovered. He comes to the conclusion that these lines may serve with great advantage for the interpretation of geoelectrical data.--W. Ayvazoglou.

PRACTICAL RESULTS OF ELECTRICAL PROSPECTING AT ABANA

By John B. DeMille

Canadian Mining Journal, vol. 51, No. 14, 1930, pp. 314-316

The basis of this discussion is an electrical survey involving three days of field work during the month of July, 1927, on the property of Abana Mi (Ltd.), northwestern Quebec. The purpose in reviewing at this time the geophysical data secured in 1927, is to check against the important underground development which has taken place subsequently.

After the description of the development of the work in the mines during the recent years the author draws the following conclusions:

1."The abana electrical indication represented the mineralized outcrop as being the surface showing of a zone of strong metallic deposition continuing both east and west from the known point.

2."The electrical axis indicated an error of S. 20° E. in the assume strike of the zone of mineralization east of the shaft.

3."The persistence and uniform strength of the conductor indicated the ore as occurring in a continuous vein rather than as a lense represented a the surface by an isolated outcrop.

4."The increase in depth of the electrical axis east of the shaft ha been found by subsequent development to correspond roughly with the contour of the east end of the main ore zone, ore in the 100-foot level being located approximately over the center of the orebody on the 550 level. While there is no apparent rake or pitch to the east, this upward tapering of the mineralized zone is an interesting detail to compare with the steep pitch of the electrica axis."

Based on the results obtained, the author's opinion is that the use electrical prospecting for solving definite problems is justified, as the accu

the possibilities indicated by electrical prospecting was to a large extent ved by the underground development. The work outlined for the survey was also plified.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

DER GEHALT DER FREILUFT AN RADIUMEMANATION UND DEREN VERTEILUNG IN DER NÄHE DES ERDBODENS NACH BEOBACHTUNGEN IN GRAZ IN JAHRE 1928

(CONTENT OF RADIUM EMANATION IN FREE AIR AND ITS VERTICAL DISTRIBUTION NEAR THE SURFACE OF THE EARTH ACCORDING TO OBSERVATION MADE IN GRAZ IN 1928)

By Walter Kosmath

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 95-113.

The author shows that the cocoanut-charcoal proceeding is suitable for e quantitative measurement of the content of radium emanation in the free air d of the change of the content with respect to the height above the ground.

Wilhelm Schmidt's theory on the RaEm distribution in free air could t be proved by experiments. However, this fact can not be taken as a final cision, as the free-air investigations described were not carried on over a ee field, while Wilhelm Schmidt's theory is strictly valid only for vertical stribution of RaEm over a free field.

The mean RaEm content of r_u (10 cm. above the ground) is equal to 173 nes 10^{-18} Curie per cubic centimeter, the maximum value of r_u being 335 times $^{-18}$ Curie per cubic centimeter and the minimum r_u 81 times 10^{-18} Curie per ubic centimeter. The ratio of the smallest concentration value of r_u to the ighest concentration value of r_u is equal to 1 : 4.

The mean concentration value r_o (11.5 m. above the ground) is equal to 3 times 10^{-18} Curie per cubic centimeter, the maximum value of r_o 270 times $^{-18}$ Curie per cubic centimeter, and the minimum value of r_o 43 times 10^{-18} rie per cubic centimeter. The ratio of the minimum value of r_o to the maximum alue of r_o is equal to about one to six.

The mean concentration ratio of r_o to r_u is 82 per cent, the minimum value ing 51 per cent and the maximum 127 per cent. The dependence of the content and the drop of RaEm in the free air in Graz on meteorological factors (pressure, op of pressure, teperature, wind, cloudiness, humidity of the soil) was establish-. There is the folllwing relation between the RaEm content and the above-mention- meteorological factors: in case of a higher pressure and increasing temperature e content of RaEm increases; it decreases in case of a negative drop of pressure ncreasing air pressure) with the value of $\frac{dp}{dT}$ increasing, as well as in the case of e increasing humidity of the soil. With increasing strength of wind the content RaEm near the surface of the ground decreases.

Cloudiness and the relative humidity do not affect, it seems, the con
tent of RaEm. The concentration ratio $\frac{r_o}{r_u}$ of RaEm, with respect to the vertical
drop of RaEm, is dependent on the above-mentioned meteorological factors becaus
of the fact that with a positive and increasing value of the drop of pressure
$\frac{dp}{dT}$, the ratio $\frac{r_o}{r_u}$ decreases and increases in case of negative and increasing
value of the drop of pressure; it increases also with the increasing strength
the wind; the ratio $\frac{r_o}{r_u}$ decreases in case of a higher air pressure and increasi
humidity of the ground. The ratio $\frac{r_o}{r_u}$ is not essentially affected by temperatu
and relative humidity.

The author also established that the very weak standard radium solut
(7.75×10^{-11} gr. Ra), received from the Physikalisch-Technischen Reichsanstal
in Berlin, were very stable.

In the supplement to this article the author describes the investi-
gations of the RaEm conditions of the air in a cellar; a daily movement of the
RaEm content was recorded, and it was established that the RaEm does not proce
entirely parallel with the conductivity of the air in the cellar. The mean Ra
value of the air in the cellar was equal to 130 times 10^{-16} Curie per cubic
centimeter, the smallest concentration value equal to 39 times 10^{-16} Curie per
cubic centimeter, and the highest 130 times 10^{-16} Curie per cubic centimeter.
The mean daily deviation is 22 per cent of the day value.

The RaEm content of the air in the cellar varied in a ratio of one to
four. The dependence of the emanation content in the air of the cellar on the
temperature was established; the RaEm content increased with the increase of th
temperature.

The RaEm content of the air in the ground was examined also; its mean
value at a depth of 75 centimeters has been found to be equal to 852 times 10^{-1}
Curie per cubic centimeter.--Author's abstract translated by W. Ayvazoglou.

6. GEOTHERMAL METHODS

NOTE ON TEMPERATURE GRADIENTS IN THE PERMIAN BASIN

By Walter B. Lang

Journal of the Washington Academy of Sciences,
vol. 20, No. 7, 1930, pp. 121-123.

Lang discusses the temperature tests made in one of the wells in New
Mexico (Transcontinental-McWhorten No. 1, Sec. 6, T.3 S., R. 22 E., De Baca
County) and notes the influence of halite and anhydrite sediments, which are
characteristic for this region, on the temperature gradients.

The varying behavior of the isogeotherms of any region can be explained on differential rock conductivities. Owing to the fact that critical data of e sort necessary to determine the influence of rock conductivities in general on temperature gradients do not exist, the author proposes that, in order to lve the geothermal problem, as many data as possible on the thermal conductivity of rocks as they exist under natural conditions be collected. --W. Ayvazoglou.

7. UNCLASSIFIED METHODS

GEOPHYSICAL PROSPECTING FOR OIL

By Donald C. Barton

lletin of the American Association of Petroleum Geologists, vol. 14, No. 2, 930, pp. 201-227.

Geophysical prospecting for petroleum strictly is an indirect method of apping geologic structure. In it, three successive steps can be recognized in l of the methods: (1) The mapping of the areal variation of some physical effect the surface; (2) the determination of the subsurface distribution of some ysical property producing the surface effect; and (3) the interpretation of the eologic situation corresponding with the distribution of that physical property. e methods have their limitations through the incomplete concordance between tructure and the distribution of those physical properties, lack of knowledge of e geophysical constants of formations, inexperience, and erroneous geologic nformation. There is a bare possibility of the direct determination of the resence of petroleum by the electric method. Although the positive value of eophysical methods has been demonstrated, they are no panacea for all the ifficulties in prospecting for oil. --Author's abstract.

ÜBER DEN ZUSAMMENHANG ZWISCHEN TÄGLICHEM TEMPERATURGANG UND STRAHLUNGSHAUSHALT

(THE RELATION BETWEEN THE DAILY VARIATIONS OF TEMPERATURE AND BALANCE OF RADIATION)

By Fritz Albrecht

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 1-35.

The registration of temperature in bright summer days in Lapland and at otsdam showed a tripartite division of the daily variations of temperature of the ir at a height of 1 or 2 meters.

According to registrations of temperature at different heights above the urface of the earth, this tripartite division might be explained as a formation f a ground inversion at night, as its removal in the morning, and as carrying way by convection at noon and in the afternoon.

The single components which have a share in the exchange of the heat on he surface of the earth were contemplated. In reference to the efflux of the

The article is supplemented by a description of mines and discussion of ological features of the Sudbury Basin made by J. B. Mawdsley. The description limited to the Falconbridge and Errington areas where geophysical studies were ie. — W. Ayvazoglou,

LES PROSPECTIONS GEOPHYSIQUES DE CARIBOU (COLORADO)

(GEOPHYSICAL INVESTIGATIONS AT CARIBOU, COLORADO)

By Ch. Finaton

La Revue Pétrolifiere, Nos. 357 and 360, 1930, pp. 161-164 and 273-278.

This is a detailed abstract of Technical Paper 439, "Geophysical vestigations of the U. S. Bureau of Mines at Caribou, Colo., "by C. A. Heiland, as. W. Henderson, and J. A. Malkovsky. (See Geophysical Abstracts No. 9).— Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN NUMBERS THREE AND FOUR OF THE "BOLETIN DE LA ASOCIACION GEOFISICA DE MEXICO."

Vol. 1, Nos. 3 and 4, September and October, 1929, pp. 56-66 and 70-84.

The following articles on geophysical prospecting appeared in numbers and 4 of the "Boletin":

1. Measurement of the content of radium emanations in the atmospheric r (Medicion de las emanaciones radioactivas contenidas en el aire atmosferico), A. A. Lomakin. This is a translation into Spanish by Prof. Juan Korzujin of the ssian article which appeared in Bull. Inst. Pract. Geophysics No. 3, Leningrad, 27 (See Geophysical Abstracts No. 2).

2. Application of geophysical methods of prospecting in practice (El pleo de metodos geofisicos en la practice), by Eng. Kurt Ritzau (See Geophysical stracts No. 8). Continuation of the article published in No. 2 of the same oletin," translated into Spanish by E. J. Helbling Ziehl. Gravitational, magnetic, d electrical methods of prospecting are discussed. The article is to be ntinued.

3. Physical principles of the gravimetric method of prospecting (Bases sicas del metodo gravimetrico), by P. Nikiforov. This is a continuation of the ticle translated from Russian into Spanish by Prof. Juan Korzujin (See ophysical Abstracts No. 8).

4. Radiometric exploration of oil deposits (Exploracion radiometrica del troleo), by L. N. Bogoyavlensky. A translation into Spanish of the Russian ticle published in Bull. Inst. Pract. Geophys. No. 3, Leningrad, 1927, pp. 113-24 (Geophysical Abstracts No. 2). — W. Ayvazoglou.

I. C. 6309

ZUR DYNAMIK DER ATMOSPHARISCHEN DRUCKSCHWANKUNGEN

(DYNAMICS OF THE ATMOSPHERIC VARIATIONS OF PRESSURE)

By H. Ertel

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 59-73.

A pressure variation at an altitude H may be regarded as the result o two partial variations. The first change results from the mass variation over This mass variation, which is the cause of the pressure variation, may be calle the "direct introduction of mass." Direct introduction of mass is the cause of the disturbances of the vertical pressure distribution. The compensation of th disturbances by vertical movements causes a second pressure variation called th "compensatory pressure variation." The effect of the two pressure changes is t measurable local pressure variation, which, of course, does not permit the draw of any conclusions with regard to the direct introduction of mass. In this pub cation the author shows that the latter has a much greater significance for the comprehension of the atmospheric pressure variations than the measurable local pressure variation.

The calculation of the direct introduction of mass, made on the assumption that the disturbances caused by the direct introduction of mass comp sate themselves through adiabatic vertical motions, gives the following result: The direct introduction of mass has a first maximum in the lower troposphere an a second maximum in the stratosphere, while the introduction of mass is slow in the middle of the troposphere. This result is the verification of the ideas of von Flicker on the mechanics of the atmospheric pressure variations.— Author's abstract.

ZUR BESTIMMUNG DER ERDGESTALT NACH ISOSTATISCHEN GESICHTSPUNKTEN

(CONCERNING THE DEFINITION OF THE FIGURE OF THE EARTH FROM THE VIEWPOINT OF ISOSTASY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 25, No. 1, 1930, pp. 81-84.

In an essay published by Astronomische Nachrichten (vol. 237, No. 566 1929), W. Heiskanen defines his position with regard to Hopfner's publications concerning the definition of the figure of the earth. In this article Hopfner more gives a clear definition of his views in the problem of the figure of the earth and points to the errors committed by Heiskanen in his replication. — Author's abstract.

POSSIBILITA PRATICHE DI RICERCHE GEOGISICHE

(POSSIBILITIES OF GEOPHYSICAL PROSPECTING IN PRACTICE)

By Arnaldo Belluigi

L'Industria Mineraria, vol. 3, No. 9, 1929, pp. 1-10.

General discussion of gravimetric, seismic, magnetic, and electric measurements is given. — W. Ayvazoglou.

INTRODUZIONE ALLA GEOFISICA MINERARIA

(INTRODUCTION TO GEOPHYSICS IN MINES)

By A. Belluigi

Issued by L'Industria Mineraria, 1929, 88 pp.

The phamphlet deals with megnetic, seismic, geothermal, and electrical methods of prospecting.

Contents of the book:

1. General conceptions on the magnetism of minerals.
2. Magnetism of minerals.
3. Magnetic variometers.
4. Seismic method and its application.
5. Geothermal method of prospecting for oil.
6. Electrical method of prospecting for oil.
7. Present conditions of the electrical method of prospecting.

Photographs and diagrams illustrate the book. —W. Ayvazoglou.

GEOPHYSICS RESPONSIBLE FOR 14 NEW FIELDS IN GULF COAST

By Jack Logan

The Oil Weekly, vol. 56, No. 7, 1930, pp. 145-146 and 212-218.

In this article Logan gives a brief history of 14 new oil fields discovered by geophysical methods of prospecting during 1929. Six of them are located on the Texas Gulf coast and eight in Louisiana. Two fields in Texas were discovered by the torsion balance and the others were found by the seismograph.

Aside from developing production on the 14 oil fields metioned above, salt domes and favorable looking structures were discovered during 1929 in at least 40 new prospective oil fields — 22 in Texas and 18 in Louisiana.

Those 40 geophysical prospects are listed in an accompanying table, showing the location of each, the company and method by which it was discovered, and the development that has been done, if any. — W. Ayvazoglou.

THE GEOPHYSICITS IN SESSION

Editorial note

Mining and Metallurgy, vol. 11, No. 279, 1930, pp. 176-178.

The following summary of the topics discussed by the geophysicits during the 139th general meeting of the A.I.M.E., held in New York in February, 1930, is given below.

"The points of the meeting which stand out in the reporter's mind are concerned with the advances in technique and with the attempt to define the training which a geophysicist should receive. The argument about the relative value of high-frequency and low-frequency methods has been put on a rational basis by the work of the United States Bureau of Mines in conjunction with Dr. Eve. They have shown that high frequency waves do not penetrate as deeply as low frequency ones, and Dr. Sundberg has shown how to take advantage of this fact in making structural studies. The Messrs. Schlumberger have presented results of astonishingly deep penetration by means of direct current in potential methods.

"The general opinion in the matter of training geophysicits seems to be that a man should have a thorough basis of geology and that this basis should include the mathematical and physical sciences. The theory of geophysics he can get as an undergraduate, but the practical application should come as a post-graduate course. In order to interpret his results intelligently he must have a thorough geological knowledge of the problem being treated. Finally, an outstanding point is that mining men now admit geophysics has come to occupy a permanent place in geological work, and that it can serve useful purposes when intelligently applied.

"After the session an open meeting of the Geophysics Committee was held at which the possibility was discussed of forming some sort of loose organization to correlate the geophysical interests of the members of various existing technical societies, without interfering with the latter in any way. By this means it would be hoped to avoid duplication of papers and efforts."--W. Ayvazoglou.

COURSES IN APPLIED GEOPHYSICS GIVEN AT THE COLORADO SCHOOL OF MINES

By C. H. C. Braden

The Colorado School of Mines Magazine, vol. 20, No. 4, 1930, pp. 23-24

The author gives a short description of the Colorado School of Mines' courses in applied geophysics for the purpose of brining to the attention of those interested in geophysical prospecting the nature and extent of the training offered at this school. The equipment available at the school for instruction in geophysics and the text books used are mentioned. -- W. Ayvazoglou.

9. NEW BOOKS

Berg, Georg, Prof. Dr., Vorkmmen und Geochemie der mineralischen Rohstoffe. Einfuhrung in die Geochemie und Lagerstattenlehre (Existence and geochemistry of mineral raw materials. Introduction into Geochemistry and study of ore deposits). Besonders für Chemiker und Studierende der allgemeinen Naturwissenschaftern. 1930. X and 390 pages, 67 figures. Price: stitched R.M. 26; bound R.M. 28. Akademische Verlagsgesellschaft .m.b.H. Leipzig.

Beyschlag, Franc. Geologic Map of the World. Berlin, W. 35, Schöneberger Ufer 12 a. Scale 1 : 15,000,000; in 12 sheets, each 25 by 31 inches. The geologic formations are shown in colors conforming to general usage with 21 divisions for sedimentary and 9 for igneous rocks. Ocean depths are shown by the 200-meter contour and the 1,000-meter contour and its multiples. The title and legend are in German, French, English, and Spanish. The first installment of four sheets, covering the northern part of the world, has been issued; the second and third installments are to be issued before the end of 1930. The map is to be sold only in complete sets of 12 sheets and legend, the subscription price being 150 gold marks (about $36).

Haalck, Hans, Dr., Die Gravimetrischen Verfahren der angewandten Geophysik (Gravimetric methods of applied geophysics). 1930. Paper cover, pp. VIII and 205 pp., 85 figs. Price, M. 16.80; Sammlung geophysikalischen Schriften herausgegeben von Prof. Dr. Carl Mainka. Verlag von Gebrüder Borntträger, Berlin.

Haalck, Hans, Dr., Die magnetischen Verfahren der angewandten Geophysik. (Magnetic methods of applied geophysics). 1930. Paper cover, VIII and 150 pp., 61 figs. and 3 tables. Price, M. 12. Sammlung geophysikalischen Schriften, herausgegeben von Prof. Dr. Carl Mainka. Verlag von Gebrüder Borntträger, Berlin.

Heine, Walther, Dr., Elektrische Bodenforschung, ihre physikalischen Grundlagen und ihre praktische Anwendung (Electrical Prospecting; Physical Foundation and practical application of it). 1928. Paper cover, VIII and 222, pp., 117 figs. Price, M. 18. Sammlung Geophysikalischen Schriften, herausgegeben von Prof. Dr. Carl Mainka. Verlag von Gebrüder Borntträger, Berlin.

Kähler, K., Prof. Dr., Einführung in die atmosphärische Elektrizitat. (Introduction in the atmospheric electricity). 1929. Paper cover, VIII and 244 pp., Price, M. 17 - 60. Sammlung geophysikalischen Schriften, herausgegeben von Prof. Dr. Carl Mainka, Verlag von Gebrüder Borntträger, Berlin.

Perrier, G. Travaux de la Section de geodosie de l'union geodesique et géophysique international. Tome 6. Rapports généraux établis a L'occasin de la 3-ième assemblée générale a Prague, 29 Aout - 10 Sept., 1927. (Transactions of the Section of Geodesy of the International Geodetic and Geophysical Union, vol. 6, General reports issued on occasion of the third general assembly at Prague, Aug.29 - Sept. 10, 1927). Published in 1929.

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XIV

BY

Frederick W. Lee

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DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 14

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

EIN DIAGRAMM ZUR BESTIMMUNG DER DIFFERENZ DER SCHWERESTÖRUNG △G IN ZWEI BEOBACHTUNGSPUNKTEN

(A DIAGRAM FOR THE DETERMINATION OF THE DIFFERENCE OF GRAVITY DISTURBANCE △G IN TWO POINTS OF OBSERVATION)

By W. Oserezky

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 69-71.

The author describes a diagram with the aid of which the difference of the anomalies of the force of gravity △g in two points of observations made by the torsion balance can be determined without any calculation.

The scale of the plane on which the vectors are drawn and that of the diagram must, of course, be taken into consideration. The method of using the diagram, which is traced on glass, by superposing it upon the plane is explained by means of a figure.--W. Ayvazoglou.

ÜBER DEN HORIZONTALABSTAND VON PENDELSTATIONEN

(ON THE HORIZONTAL DISTANCE BETWEEN PENDULUM STATIONS)

By Robert Schwinner

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 111-114.

Geological interpretation requires that the difference between the values obtained by two neighboring gravity stations shall always have a correct sign. Therefore, the author proposes that the pendulum stations chosen on a cross section be at such a distance one from another that the value of the probable difference becomes six times as great as the value of the mean error of the measurements. Author's abstract, translated by W. Ayvazoglou.

DIE BELOWSCHE METHODE ZUR BESTIMMUNG DER WIRKUNG GEGEBENER MASSEN AUF KRÜMMUNGSGRÖSSE UND GRADIENT, IHRE VERALLGEMEINERUNG FÜR BELIEBIGE MASSENFORMEN UND IHRE ANWENDUNG AUF "ZWEIDIMENSIONALE" MASSENANORDNUNGEN

(BELOW'S METHOD FOR THE DETERMINATION OF THE EFFECT OF GIVEN MASSES UPON THE CURVATURE VALUE AND GRADIENT, THEIR GENERALIZATION FOR ANY FORM OF MASSES AND THEIR APPLICATION TO "TWO-DIMENSIONAL" ARRANGEMENT OF MASSES)

By Karl Jung

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 114-123.

Below's method, mentioned in Nikiforov's article "Physical principles of the gravitational method of prospecting" (see Geophys. Abst. 2), concerning

he proceeding of topographic correction of the curvature value and of the gradent for far remote parts of the terrain is discussed. The author shows how his proceeding can be applied for any form of the mass and how it can be transerred to the determination of the effect of "two-dimensional" deposits. Diagrams howing Below's method are given and their use is explained. List of literature s added.--W. Ayvazoglou.

DIE UNDULATIONEN DES GEOIDS UND DIE SCHWEREANOMALIEN

(UNDULATIONS OF THE GEOID AND GRAVITY ANOMALIES)

By W. Heiskanen

Gerlands Beiträge zur Geophysik, vol. 25, No. 2, 1930, pp. 148-154.

Hopfner maintains the opinion that the gravity anomalies in mountains nd on oceans can be explained without the isostatic principle, solely by Bruns' erms. In the present essay it is shown that in such a case the geoid beneath he Alps and in the Rocky Mountains must be considered to be situated about 350 eters over and on the oceans about 1,000 meters under the spheroid and that the eflections from the vertical would amount in Lombardy and Bavaria to about 16 eet and in Ireland, Spain, and California to 3 to 6 feet. But as these values re in contradiction with observations, Hopfner's assertion must be considered s inconclusive.--Author's abstract.

ZUR GROSSE DER GEOIDUNDULATIONEN UND IHRER BERECHNUNG AUS LOTABLENKUNGEN

(ON THE VALUE OF GEOID UNDULATIONS AND THEIR CALCULATION FROM THE DERIVATIONS OF THE PLUMB LINE)

By F. Hopfner

Beiträge zur Geophysik, vol. 25, No. 2, 1930, pp. 155-162.

In vindication of their methods of work and in order to insure the results obtained by them, the representatives of the method of isostatic reduction in geodesy try to prove that the undulations of the geoid are probably very minute. In this article the author shows that the reasons brought up by them can not stand the test.--Author's abstract.

RECENT PROGRESS IN GRAVITY DETERMINATIONS AT SEA

By C. H. Swick

Geographical Review, vol. 20, No. 2, 1930, pp. 278-282.

Swick describes the results of some gravity determinations at sea performed by Dr. Meinesz for studying ocean areas in order to establish whether isostasy exists there and, if so, what the variations from the ideal condition are.

The new Meinesz apparatus, used by him during his last expedition in 1929, is arranged so that the combined or relative oscillations of the two pendulums of a pair are traced directly on the record instead of the oscillation of each pendulum separately, as in the original apparatus. In addition to the enormous saving of time in making computations, the accuracy of the derived quantities is increased and there is less opportunity for making errors in the computations. A brief description of the present apparatus is given.

The computation of the isostatic reductions at the 250 stations determined during the expeditions has been made by the Coast and Geodetic Survey, and the author states that isostasy exists over the oceans to almost the same complete extent that it does over land areas; the gravity formulas, which are now based entirely on land determinations, must, however, be somewhat modified.-- W. Ayvazoglou.

2. MAGNETIC METHODS

ÜBER TÄGLICHE ERDMAGNETISCHE VARIATIONEN IN ZWEI ALPENTÄLERN

(CONCERNING DIURNAL EARTH-MAGNETIC VARIATIONS IN TWO VALLEYS IN THE ALPS)

By J. Koeningsberger

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 74-78.

Several diurnal variations of Z, H, and δ were observed in two deep valleys in the Swiss Alps. A comparison with variations observed in Seddin (Potsdam) and Val Joyeux (Paris) shows that the disturbances of more than 5 γ amplitude and less than 10 minutes of duration occurring at these two stations could not be observed at that time in the valleys of the Alps. In these Alpine stations, which are situated more to the south, the curves were very smooth.-- Author's abstract, translated by W. Ayvazoglou.

RESULTATS DES MESURES MAGNETIQUES FAITES SUR LE MASSIF DE SEL D'HETTENSCHLAG (HAUT-RHIN)

(RESULTS OF MAGNETIC MEASUREMENTS MADE OVER THE HETTENSCHLAG SALT MASSIF IN UPPER RHINE)

By P. Geoffroy, Th. Koulomzine, and A. Gorodisky

Annales des Combustibles Liquides, vol. 4, No. 6, 1929, pp. 1,015-1,021.

The Hettenschlag salt massif was discovered by the electrical method of prospecting. The discovery was confirmed by borings. The purpose of this article is:

1. To show that the magnetic anomalies of the massif are of a measurable value.

2. To prove that the measurements are sufficiently accurate for the establishment of the influence of the massif.

3. To compare the magnetic anomalies with the electric ones.

Measurements were made from December 22 to 28, 1928. Haalck's riometer was used. The values of the anomalies at 30 stations, distributed ong two profiles, are given in a table. The coincidence of graphical repre-ntation of the results obtained by both methods must be considered to be od.--W. Ayvazoglou.

MAGNETOMETER SURVEY OF LITTLE FRY PAN AREA, UVALDE AND KINNEY COUNTIES, TEXAS

By R. A. Liddle

lletin of the American Association of Petroleum Geologists, vol. 14, No. 4, 1930, pp. 509-517.

Magnetometer investigations of igneous intrusions along the western d of the Balcones fault zone in the southwestern part of Texas show that the trusions are highly magnetic. Some plugs are positive and others negative; several, splinters of igneous rock were found to be polarized. The results the work in this area indicate that the magnetic instruments can be used with ccess to determine the presence or absence of buried igneous intrusions.-- thor's abstract.

TEMPERATURE-COMPENSATION AND ADJUSTMENT OF MAGNETIC VARIOMETERS

By H. E. McComb and A. K. Ludy

rrestrial Magnetism and Atmospheric Electricity, vol. 35, No. 1, 1930, pp. 29-35.

The authors describe a horizontal-intensity variometer of the Schulze pe installed at the Tucson (Arizona) Magnetic Observatory in November, 1929. ie instrument is provided with equipment for temperature-compensation, scale-alue control, and a thin prism for production of a reserve spot. In addition these improvements the variometer was equipped with a quartz-filament suspen-ion, the tips of which were bent at right angles before attachment to the pports.

The instrument has been functioning in a very satisfactory manner. A escription of some of the instrumental details, technique of manipulation of ie filament, and subsequent adjustments is given.

The instrument was compensated for temperature, and the effectiveness this compensation was checked in a short time by determination of base-lines nen the instrument was operated at different temperatures.--W. Ayvazoglou.

I.C.6324.

DEPTH FINDING BY MAGNETIC TRIANGULATION

By Noel H. Stearn

Engineering and Mining Journal, vol. 129, No. 8, 1930, pp. 396-399.

The system of applying the magnetic triangulation method of depth-finding described in this article has yielded the following results in two know cases:

	Well log depth, feet	Calculated depth, feet	Discrepancy, feet	Per c
Sheridan peridotite	2,254	2,320	66	2.
Rison peridotite	3,561	3,671	110	3.

These results are well within usable limits of error. The author explains, however, that these two cases offer what are in some respects exceptionally favorable geological set-ups for the application of the method, although possibly not the most favorable. H. R. Aldrich points out that more favorable geological conditions would be encountered in measuring the depth to a regular east-west ridge such as might be formed by a buried iron formation.

On the other hand, G. C. Branner, State Geologist of Arkansas, has reached the conclusion that less favorable geological conditions would be offer by a large and irregular intrusive mass, but that usable results may be obtain from many combinations of geological conditions is clearly indicated.

Economy of operation of this system is assured by the fact that the equipment required consists of a single instrument capable of rapid manipulati An idea of the time element involved can be gained from the accompanying data from the field tests.

This time schedule involves the depth-finding data alone, after the anomalies had been previously located and outlined.

	Field work	Computation and plotting
Sheridan peridotite.....	2 hrs.	1 1/2 hrs.
Rison peridotite.....	4 hrs.	2 1/2 hrs.

Certain limits to the applicability of this use of the magnetic triangulation method are established instrumentally by the dipping circle feature of the Hotchkiss Superdip.

The procedure here outlined can be applied only to those anomalies which produce a sufficiently marked change in the inclination of the earth's field to be readable on the instrument. This can be read to about 15 minutes arc. The variation produced by the Sheridan plug amounts to 1 1/2 degrees. Clearly there is a considerable margin of applicability to smaller anomalies.

Of course, magnetic inclination can be read to within much finer imits of error on a standard dipping circle. But whether anomalies which pro- uce changes in magnetic inclination of less than 15 minutes of arc are of suffi- ient magnitude to warrant attempts at depth finding is yet to be established.-- uthor's abstract.

USE OF MAGNETOMETER IN SOUTH TEXAS

By L. Spraragen

The Oil and Gas Journal, vol. 28, No. 52, 1930, pp. 42, 138-139.

Spraragen discusses the possibility of a magnetometer survey in south exas, as there exists an erroneous impression that it can be of no assistance n that section.

Several illustrative examples of magnetometer surveys made on the type f structure usually sought for in the south Texas counties are given. In con- lusion the author says: "It is hoped that the few examples cited in this paper ill clearly and effectively point out to the reader the following facts: First, hat the magnetometer can be used to advantage in outlining Serpentine plugs; econd, that the magnetometer has some value, depending on accuracy, for fault urvey work; third, that if readings are taken with a high degree of accuracy he contour interval can be taken at 5 or 10 gamma and in such a case a map con- oured on a 5-gamma interval actually reveals structural conditions which other- ise would have been passed over with the magnetometer.

"Therefore it should be emphasized that the magnetometer work in south exas is a matter of accuracy, requiring considerable foot work and Brunton urveying." Maps showing the results of the magnetometer surveys in different ounties (Bastrop, Caldwell-Dale Field, Medina, Caldwell-Buchanan Field, uadalupe and Gonzales) are added.--W. Ayvazoglou.

3. SEISMIC METHODS

DIE WIRKUNG DER OBERSTEN ERDSCHICHT AUF DIE ANFANGSBEWEGUNG EINER ERDBEBENWELLE

(THE EFFECT OF THE UPPERMOST EARTH LAYER UPON THE INITIAL MOVEMENT OF AN EARTHQUAKE WAVE)

By M. Hasegawa

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 78-98.

If a longitudinal sine wave penetrates into the uppermost earth layer, hen one point on the surface performs an elliptical oscillation, the path of hich lies in the plane of incidence. If the arriving wave is a single longi- udinal impulse, then the movement of the point consists of a series of impulses.

If the first impulse is influenced by the following ones, the deformation of the horizontal and vertical components of the first one are not equal. In this article the author examines how the apparent emergency angle of the initial movement changes, in case of the incidence of the sine-shaped shock, with regard to the period of the wave and the thickness and elasticity of the layer.

As an example of the application to the method of prospecting of the underground the author establishes by this new method the depth of the so-called Mohorovcic layer in Japan. A value equal to 55 kilometers was found for Kyoto.--Author's abstract, translated by W. Ayvazoglou.

UEBER DIE ELASTIZITAT DER GESTEINE

(ON THE ELASTICITY OF ROCKS)

By Hans Breyer

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 98-111.

In this article an account is given of the investigation of some German congelation rocks, dwelling especially on the determination of their elasticity moduli, elastic changes, and permanent alkaline changes, and taking into consideration the structure. The author determined that German rocks are, as far as their elastic properties are concerned, similar to the corresponding American rocks, and that in case of equal pressure the basic rocks possess a higher elasticity modulus, a smaller elastic change of form, and a smaller permanent change of form than the acid rocks.

The author finds it necessary that, as is already done with steel and iron, the elastic properties of the rocks be statically investigated also; and, owing to the importance of engineering construction, that road building and ballasting of railroads be also examined dynamically with regard to their resistance against oscillating stress. The procedure of the experiment is described and a list of rocks tested given.

The arrangement of the mirror apparatus which served for taking the measurements is explained, and a sketch of it is given. The results of the experiments are shown graphically. In conclusion the author compares, in a table the values of the rocks tested with those obtained by Adams and Williamson, as well as by Adams and Coker.--W. Ayvazoglou.

HARMONISCHE SCHWINGUNGEN DES UNTERGRUNDES

(HARMONIC OSCILLATIONS OF THE UNDERGROUND)

By R. Köhler

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 123-126.

The existence of oscillations of single layers in the underground is still in question, as the results of experiments are somewhat contradictory.

hler points out that at least the existence of harmonic oscillations of single yers can be proved.

Seismic investigations described in this article were made by the odetic Institute in Potsdam under the direction of Prof. Angenheister. Two fferently constructed horizontal seismographs were used. The results are dis- ssed on the basis of the seismograms obtained.--W. Ayvazoglou.

NEW SEISMOGRAPH FOR GEOPHYSICAL SURVEY

By A. O. Rankine

The Mining Magazine, vol. 42, No. 3, 1930, pp. 147-150.

A brief description, illustrated by photographs, of the new seismograph given in this article. Its principal features are indicated. A more complete scription of the working parts of the instrument may be found in British Patent 402/29.

According to the author of this article, tests made in his presence ring April, 1929, have shown good results and it was apparent that the sensi- vity of the instrument was considerably superior to that of other mechanical ismographs then on the market. A reproduction of two records taken with this strument of small explosions of gelignite (1 pound, distance 1,200 yards; and 1/2 pounds, distance 1.200 yards) buried a short depth in chalk is added.-- Ayvazoglou.

A FIELD TEST WITH A NEW SEISMOGRAPH

By H. Shaw

Mining Magazine, vol. 42, No. 4, April, 1930, pp. 201-212.

Tests with a new electrical seismograph devised by the Cambridge Instru- ent Co. were conducted over an area which is well known, as regards subsurface ructure, from a previous gravity survey and from bore-hole information.

The object of the investigation was to test the applicability of the eismic method to the location of simple structures and to ascertain the suit- bility of the Cambridge instrument for this purpose. The area is known to be raversed by a well-marked fault, the position, strike, and throw of which have already been determined fairly accurately, and in order to investigate this fault, three profiles were shot across it in a direction perpendicular to the strike. rom an examination of the resulting time-distance curves, the position and throw f the fault are found to coincide very closely with the characteristics assumed rom other data.

In addition to this a profile was shot parallel to and on the upthrown side of the fault along a line passing through a borehole, in order to determine the depth below the surface of the limestone-drift interface. This determination of the depth differed from the borehole value by only 5 per cent.--Author's abstract.

PROSPECTING WITH ARTIFICIAL EARTHQUAKES

By Karl L. Kithel

Scientific American, vol. 140, No. 6, 1929, pp. 508-511.

General principles of the seismic method of prospecting are explained. Only the simplest form of application is described. Ten figures illustrate the article.--W. Ayvazoglou.

PERIODIC RAYLEIGH-WAVES CAUSED BY AN ARBITRARY DISTURBANCE

By Katsutada Sezawa

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 2, 1929, p. 19

The object of this paper is to solve the question as to whether the regularity of the periods of the pulsatory motion of the ground may depend on the time intervals of the disturbances or on the restitutive nature of the ground; and also to determine the nature of the long trailing train of waves of the harmonic type which follow the main tremors of the earthquake movements.

The formulation of the dispersion of waves has been obtained by assuming that in the case of the surface waves the velocity of the phase of the harmonic waves is equivalent to that of Rayleigh-waves on a stratified body and that other treatments are quite analogous to those of the ordinary surface waves. The principal results which have some importance in seismology are enumerated as follow:

1. In spite of the application of a single disturbance at the origin a semi-infinite body of a certain dispersive nature, the generated surface waves are of a harmonic type.

2. The leading part of the train of these waves is propagated with the velocity of a special Rayleigh-type wave.

3. The periods of the successive oscillations of the harmonic displacements are of a gradually increasing nature.

4. The amplitudes of the successive oscillations are, in the case of two dimensions, of a gradually decreasing character, while in the three-dimensional problem they are more quickly decreasing.

5. The order of the length of the periods depends on the dispersive nature of the body; i.e., the elasticities, the effective thickness of the layer and some dispersive constants.

6. In certain dispersive waves there are abnormal regions of the earthquake movements at certain periodic distances from the epicentre.--Author's abstract.

THE DISPLACEMENT INDEPENDENT OF THE DILATION AND THE ROTATION IN A SOLID BODY

By Katsutada Sezawa and Gonrokuro Nishimura

lletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 389-416.

In this article the authors examine some facts which may be important the geophysical problem as well as in applied mechanics. Although the general eory was considered by means of somewhat restricted examples, yet the theory ever lost its applicability to all cases of the problem. To the dissatisfaction the authors the various cases of the inelastic deformation could not be solved ing to the lack of time. The principal results of the present investigation e as follows:

1. The deformation of an elastic solid body in equilibrium is composed of the dilatation, the rotation, and another component which is neither dilatational nor rotational and which is an important component in affording the stresses of the strains.

2. The dilatational and the rotational components of displacement are not independent; the ratio of the constant factors belonging to these is determined only by the elastic constants of the material and the order of the harmonics of the straining. The component which is not dilatational nor rotational has an independent arbitrary constant factor.

3. The types of the solutions of the dilatational and the rotational components resemble one another, while that of the third component takes a different form.

4. By applying the present method of calculation to various cases of examples, the solutions of the various problems can be found easily. Especially the solution of the heterogeneous distributions of the material in the displacements and stresses shows that the so-called block-movement may be nothing else than the effect of such a heterogeneity of physical constants on the movements of the material points.

5. In an inelastic solid body, a nature similar to that in the elastic body manifests itself. The method of the addition of all components to obtain a complete solution in this case is somewhat complicated.

6. A new idea of investigating the problem of plasticity is obtained. The defect of the prevailing theory of plasticity, in which the condition of the compatibility is neglected, can be replaced by some improved theory.

7. The unnecessary condition of the incompressibility of the plastic material may be replaced by another controllable equation indicating the state of the material.

8. It is pointed out that the position and the number of the cracks a strained material can not be explained by the prevailing plasti theory to the same degree as the ordinary application of the elas theory, and that the above question can be solved even in the the of elasticity by considering the effect of all the boundary condi tions as in the manner of the students in England.

9. It is also added that the so-called block-movement advocated by t seismologists can not be explained by the plastic theory; rather involves a great number of doubtful points when it is considered the true theory of inelasticity as well as from some other theore cal points.--Author's abstract.

PROPAGATION OF LOVE-WAVES ON A SPHERICAL SURFACE AND ALLIED PROBLEMS

By Katsutada Sezawa

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 437-454.

The results of the investigation of the propagation of "Love-waves" o a spherical surface are summed up by Sezawa as follows:

"1. Long Love-waves having azimuthal distribution on a spherical sur face have the large colatitudinal component of displacement, be- sides the ordinary azimuthal component, and this colatitudinal component can not disappear even at the equatorial circle.

"2. The vertical component is not existent from the start.

"3. The velocity of the propagation of the Love-waves on a spherical surface is approximately equal to that on a plane surface even though the waves are relatively long.

"4. The dispersion of Love-waves is possible also on a spherical sur face.

"5. The growth of Love-waves toward the antipode is possible also.

"6. The azimuthal variation of displacement of Love-waves is maintai toward the antipode.

"7. In considering the neighborhood of the origin, the longitudinal component of displacement of the short waves becomes quiescent a the waves are propagated towards infinity. When the waves are

generated from an internal source, the displacement at the free surface works together with the modes of the oscillations at the origin.

"8. In this case the azimuthal variation of the azimuthal displacement at the surface conforms for all radial distances to the type of the oscillations of the internal source.

"9. When the source is situated at the bottom medium, the amplitude of the surface waves decreases with the depth of the source in the bottom medium at the rate of $e^{-\beta_1 \xi}$. It is interesting to compare this with the case of Rayleigh-waves in which the amplitude of the waves is proportional to $e^{-\alpha_1 \xi}$ $(\alpha_1 > \beta_1)$

"10. When the source is situated at the superficial layer, the amplitude of the surface waves varies at some harmonic functions of ξ."-- Author's abstract.

ON THE NATURE OF EARTHQUAKES STUDIED BY MEANS OF THE SEISMIC WAVE ANALYSER

By Kyoji Suyehiro

lletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 467-471.

Suyehiro states that his seismic wave analyser, which works under the inciple of selective resonance, can be used for studying the nature of an earthake by detecting successive fresh waves.

From the record given by this instrument the number of shocks in an rthquake can be detected, except when the shocks emanate simultaneously from a rrow region or continuously one after another from an extended region. The cords of 16 earthquakes made by this instrument are given in a table and their lues are discussed.—W. Ayvazoglou.

THE SCHWEYDAR TWO-COMPONENT SEISMOGRAPH

By A. B.

The Instrument World, vol. 1, No. 11, 1929, pp. 335-336.

After a few remarks on different types of existing seismographs and heir practical application, the author describes the Schweidar two-component eismograph consisting of a double pendulum and the recording device. The record- ng device is placed about 1 meter distant from the pendulum and is connected with by a light rigid funnel or telescope-jointed tube to prevent outside light ffecting the sensitized paper. The operation of the recording device is described. he seismograph consists of two pendulums -- one for the vertical and one for the

horizontal components. The heavy mass weighs about 1,800 grams; the reduced length of the pendulum is 6.89 centimeters; the natural period is about 0.07 seconds.

The vertical movement of the ground is made approximately horizontal the aluminum lever and is mechanically magnified about 8 times; this magnificat is increased considerably by the combination of the friction of the wire on the vertical axis with the optical lever. This magnification depends on the ratio the focal length of the lens in front of the seismograph mirror divided by the radius of the vertical axis (lever principle) to be doubled on account of the reflection. As the diameter of the little axis is about 2 millimeters and the distance of recorder and pendulum about 1 meter, the combined magnification of friction and optics is about 2,000. Hence, with the mechanical magnification, the portable seismograph of Schweydar has a magnification of about 16,000 for infinitely small periods.

The magnification of both the vertical and horizontal pendulums, as wv as their natural periods, are exactly alike. The pendulums may be used damped undamped. The latest types have an arrangement for oil-damping.-- W. Ayvazoglou

4. ELECTRICAL METHODS

LA PROSPECTION ÉLECTRIQUE ET SES RECENTS PROGRÈS

(ELECTRICAL PROSPECTING AND ITS RECENT SUCCESSES)

By G. de Grand'ry

Revue universelle des mines, vol. 75, Series 8, Nos. 5 and 7, 1930, pp. 136-141 and 188-198.

The following electrical methods of prospecting, based on the differe electrical conductivity of rocks and successfully applied in practice, are described:

1. Electromagnetic method by which characteristics of magnetic field produced in a conducting body by alternating field are determined
2. Inductive method which differs from the first method only in the manner of producing the alternating field obtained by induction.
3. A method consisting of determining the electrical resistances.

The three methods are described and for each of them examples of appli cation are given.--W. Ayvazoglou.

ZUR ERMITTLUNG AUSGEDEHNTER SCHICHTEN VERSCHIEDENER LEITFAHIGKEIT

(ON THE DETECTION OF EXTENSIVE LAYERS OF DIFFERENT CONDUCTIVITY)

By J. Koenigsberger

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 71-73.

Two geoelectric proceedings are described in order to determine the stence of layers with good or bad conductivity, the depth of their horizontal it surface, as well as their conductivity, by means of relative measurements the quotients of the potential difference or of the intensities obtained by connection of the current at two points (Stromdipol). The measurements are e on the continuation of the dipole-axis, so as to avoid the disturbing in- ence of the leading-in wire, which is direct for alternating current, and irect for induction. In case of layers with better conductivity, the measure- t of the quotients of the potential differences by using probes is more irate, and in case of layers with bad conductivity the more accurate way is t of measuring the quotients of the intensity. Maximum effect is obtained n the distance between the primary electrodes is approximately two or three es greater than the depth of the upper limit-surface of the layer. Faults strikes of layers can also be determined qualitatively by measuring the quo- nts along four directions perpendicular one to another.--Author's abstract, nslated by W. Ayvazoglou.

SUR LA DISTRIBUTION ELECTRIQUE POTENTIELLE AUTOUR D'UNE PRISE DE TERRE PONCTUELLE DANS UN TERRAIN A COUCHES HORIZONTALES HOMOGENES ET ISOTROPES

(ON THE POTENTIAL ELECTRIC DISTRIBUTION AROUND A SMALL GROUND CONNECTION ON A TERRAIN WITH HORIZONTAL, HOMOGENEOUS, AND ISOTROPIC LAYERS)

By S. Stefanesco and C. and M. Schlumberger

Journal de physique et le radium (Publication de la societe francaise de physique), vol. 1, Series 7, No. 4, April, 1930, pp. 132-141.

The purpose of this article consists of solving the problem of distri- ion of potential inside of horizontal, homogeneous, and isotropic layers by s of a method based on the use of Bessel's function of the first kind. It is possible to express by definite integrals the potential of each of these s, no matter what the number of them, their thickness, and their specific stivity may be.--Authors' abstract.

5. RADIOACTIVE METHODS

A CONVENIENT FORM OF GEIGER TUBE COUNTER

By L. F. Curtiss

Bureau of Standards Journal of Research, vol. 4, No. 4, 1930, p. 593.

In this article Curtiss describes a design of a new Geiger tube cou which he has found very satisfactory. When used for the detection of gamma r tion, or high velocity beta radiation, the new Geiger tube counter may readil put in a form that is portable and independent of pumps. A figure showing th longitudinal cross section of a completed counter is given.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

LES MESURES DE TEMPERATURES DANS LES SONDAGES

(MEASUREMENT OF TEMPERATURE IN BOREHOLES)

By G. Friedel and V. Maikowsky

Le genie civil, vol. 45, No. 23, 1929, pp. 568-569.

Owing to the fact that the use of medical or other types of maximum thermometers at depths over 1,000 or 1,500 meters requires their inclosure in tight-shut strong steel boxes and that the indications of the thermometers an be corrected for high and very uncertain pressures, the use of open-tube ther mometers without a graduation scale is proposed. The tube of such a thermome is cut obliquely at its upper end at an angle of about 45° or a little more t the axis of the tube. The reservoir and the tube are filled with mercury so the latter may rise to the orifice at a temperature which is surely inferior that expected at the point of measurement.

Two or three thermometers prepared in this way can be lowered, pro- tected by a simple sheet-iron box filled with clear water, as the pressure wi not have a notable effect on the open tube. The thermometers should be left the borehole for about 24 hours.

At a depth fixed for the measurement the mercury will rise above th open end of the tube and one part of mercury will escape. After the removal the thermometers they are heated side by side with a graduated thermometer un the mercury rises again up to the orifice; this moment will show the temperat measured in the hole at the desired de th, and its amount can be read from th graduated thermometer.

Temperature curves obtained from measurements made with this type o thermometer in the potassium mines in Alsace and in the saliferous basin of t Upper Rhine varied from those obtained previously. The curves showing the di tribution of the temperature at depths exceeding 1,000 meters were almost str

es, the geothermal degree being almost constant and equal to about 25 meters.--Ayvazoglou.

GEOTHERMICS AS A MEANS OF LOCATING PETROLEUM DEPOSITS

Editorial Note

The Petroleum Times, London, vol. 23, No. 588, 1930, pp. 713-714.

In this article interesting details of measurements of temperatures in e geological substructure and their use in discovering petroleum deposits are scussed. The account on investigation appeared in a monograph entitled "The se of the Varying Geothermic Depth Progression in the North German Salt Stocks," H. Werner (Senior mining councillor of the Hanoverian administrative district Celle.)

The author shows the warming influence of oil deposits by mentioning at, for example, in a borehole at Sottorf in the Hamburg district, where a irly strong influx of oil was met, the temperature increased 1° every 59 feet, a gas well near Hamburg the 1° increase took place every 85 feet, whereas in deep dry hole in the same neighborhood an interval of as much as 170 feet was quired to produce the increase. (As a general rule the temperature of the rth increases by 1° C. every 105 ft.)

Although there might be other reasons causing the abnormal increase of mperature, petroleum depocits must also be regarded as special sources of heat the earth's crust. The practical value of the discovery that petroleum de-sits cause a rise in temperature in adjacent salt stocks can result, according the author, in the fact that instead of putting down one deep borehole of, , 3,000 feet, a number of shallow holes averaging 650 feet can be drilled. but 20 can be drilled for the cost of the one deep hole. They should be placed 0 to 500 yards away from the ascertained edge of the salt stock, at intervals about 1,000 yards. At the spot where the greatest increase in temperature curs, a deep hole should be drilled. The author adds that even if this pro-dure is not an absolutely reliable guide, it is at the moment the cheapest thod promising success.—W. Ayvazoglou.

7. UNCLASSIFIED METHODS

DIE VERTEILUNG DER MASSEN AN DER ERDOBERFLÄCHE

(DISTRIBUTION OF MASSES ON THE SURFACE OF THE EARTH)

By L. Kober

Gerlands Beiträge zur Geophysik, vol. 25, No. 2, 1930, pp. 163-174.

An attempt is made here to find an explanation of the formation of the rth's surface and the distribution of the masses, based upon the whole of the

endogene and exogene geological forces and phenomena. The distribution of the masses depends upon a certain independence of the outer crust of the earth (the "facial zone"), the tendency of land and water to balance each other, upon the inner structure, the quantity of water, the density relationship of land and sea, the rotation of the earth, and upon some other causes which are discussed. The decisive factor is that there exists a regional compensation between land and sea. The ideal arrangement would consist of the inverse relation of quantity and density. This fundamental law of the distribution of the masses can also be recognized in the actual arrangement which is such as would result from a general relativity between land and sea. The whole and its parts are in the closest connection; the whole range of geological and geophysical phenomena and relationship must be taken into consideration.--Author's abstract.

GEOPHYSICAL SURVEYING IN TASMANIA

Editorial Note

The Industrial Australian and Mining Standard, vol. 83, No. 2, 129, 1930, p. 98

Four ore bodies of copper-nickel have been discovered in the district of northeast Dundas. The work was performed by the Mines Department under arrangement with the Imperial Geophysical Survey Committee. The results show the accuracy of the surveys and the suitability of the various types of instruments that were used. There were no indications of these ore bodies on the surface but the survey indicated that they would be found, and they were at a shallow depth. The principal instruments used were those of the electromagnetic type. At present these tests are of interest more from the scientific than from the commercial point of view.--W. Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN VOLUME 1, NO. 5, OF THE "BOLETIN DE LA ASOCIACION GEOFISICA DE MEXICO"

Boletin de la Asociacion Geofisica de Mexico, vol. 1, No. 5, November, 1929, pp. 87-96.

1. Measurement of the content of radium emanation in the atmospheric air, by A. A. Lomakin. Translated from Russian into Spanish by Prof. Juan Korzujin (see Geophys. Abs. 13).

2. Application of geophysical methods of prospecting in practice, by Kurt Ritzan. Conclusion of the article published in previous articles of the "Boletin;" translated into Spanish by E. J. Helbling Ziehl (see Geophys. Abs. 1

3. Physical principles of the gravimetric method of prospecting, by P. Nikiforov. A continuation of the article translated from Russian into Spani by Prof. Juan Korzujin (see Geophys. Abs. 13).--W. Ayvazoglou.

EXPERIMENTS RELATING TO SALT-DOME STRUCTURES

By Theodore A. Link

lletin of the American Association of Petroleum Geologists, vol. 14, No. 4, 1930, pp. 483-509.

The description and illustration of a series of laboratory experiments hich were originally designed for the reproduction of miniature igneous intru-ons are offered as suggestive material relating to the study of salt-dome struc-ires. Graded materials, ranging from rigid to fluid, were injected from below ito artificial sediments. Only such features as developed and were observed epeatedly are enumerated and suggested for consideration.--Author's abstract.

MODERN PROSPECTING ON AN INDUSTRIAL SCALE

By C. I. Tennberg

hemical Engineering and Mining Review, vol. 22, No. 256, 1930, pp. 132-133.

The author discusses briefly the application of different geophysical ethods of prospecting on an industrial scale. He draws special attention to the ossibilities of the application of the electrical methods of prospecting and ries to answer the question: "What depths are attained in electrical prospecting or ores?" He says: "Unfortunately there is no simple and direct answer, because he depth is a function of at least three variables -- the conductivity of the round as a whole, the conductivity of the ore bodies to be located, and also the imensions and shape of these ore bodies. Assuming a favorable case with lenticu-ar bodies of solid sulphide ore in a practically insulating country rock, it ight be stated that a good surface indication is still obtained if the upper rface of the ore body is not situated at a greater depth than half of its length.

"No greater depths than 1,000 feet have been attained. In prospecting or oil, electrical methods have been successfully applied to structural work nly, and it has not been possible so far to locate oil directly."--W. Ayvazoglou.

FUTURE GEOPHYSICAL PROSPECTING IN AUSTRALIA

Editorial Note

hemical Engineering and Mining Review, vol. 22, No. 257, 1930, pp. 100-101.

The opinions of two geophysical specialists who have left Australia re-ently after having investigated the possibilities of geophysical prospecting in ustralia and in Tasmania are given: 1. Although the report of Mr. A. Broughton idge is in the course of preparation it is expected that very important facts will e disclosed which will lead to future work being done in Australia; 2. According o Mr. Tennberg, conditions for electrical ore prospecting seem to be very favor-ble in western Tasmania. In New South Wales the Cobar area is of special inter-st, as well as the areas west of Broken Hill. There are also good prospects in ueensland. As to oil, the conditions generally seem to be more suited to electri-al methods than to any other form of geophysical prospecting.--W. Ayvazoglou.

REVIEW OF THE GEOPHYSICAL METHODS OF PROSPECTING

By Donald C. Barton and E. Buhler Summers

The Geographical Review, vol. 20, No. 2, 1930, pp. 288-301.

The advancement in the methods of geophysical prospecting in general is noticed and a more detailed description of the four methods (gravitational, magnetic, electric, and seismic) widely used at present is given. The theories on which these methods are based and the attainments of the last years, especially for the discovery of salt domes, are discussed. The radioactive and geothermal methods, the application of which for practical purposes so far is of no importance, are mentioned very briefly. The last part of the article deals with the limitations of the geophysical methods of prospecting.--W. Ayvazoglou.

BIG POTENTIAL RESERVE ON GULF COAST

By Neil Williams

The Oil and Gas Journal, vol. 28, No. 49, 1930, pp. 42-43 and 118.

On the basis of figures, the author states that the Gulf Coast must be considered to be one of the largest potential petroleum reserves known to this industry. Within the past two years Gulf Coast production has been mounting steadily, until now it is the highest it has been at any time in its history. The increasing growth of discoveries must unquestionably be attributed to geophysics. Before the introduction of geophysics there were 42 known domes. Twenty-nine of these, or 69 per cent of the total, have been proved commercial producers. Using these figures as a guide Williams assumes that approximately 75% of the 110 geophysically discovered domes and prospects now known will eventually be commercial fields.

In the following table total domes, prospects, and fields are shown (some of them so far unproved as domes by the drill):

	Geophysical	Nongeophysical	Total	Total productive
South Texas.....	59	30	89	35
South Louisiana.....	51	18	69	24
Total.....	110	48	158	59

The following figures of geophysical discoveries by years show the development of the geophysical methods of prospecting:

Year	South Texas	South Louisiana	Total
1924.....	3	0	3
1925.....	4	2	6
1926.....	1	5	6
1927.....	5	9	14
1928.....	18	20	38
1929.....	24	15	39
1930.....	4	0	4
Total	59	51	110

Two maps, one of the Louisiana Gulf Coast field and another of the xas Gulf Coast field, marked with marks for productive and nonproductive salt es and structures, are given. A detailed list of geophysical domes and pros- cts discovered in South Texas and South Louisiana is added.--W. Ayvazoglou.

9. NEW BOOKS

zard, Daniel L. Results of magnetic observations made by the United States Coast and Geodetic Survey in 1928. U. S. Coast and Geodetic Survey. Serial No. 455, 35 pages. Government Printing Office, Washington, D.C., 1929, price 10 cents. Contents: 1. Introduction; 2, Distribution of stations, 3. Secular change of the magnetic declination, 4. Instrumental corrections, 5. Diurnal variation correction, 6. Arrangement of Tables, 7. Magnetic observations, table of results.

zari, Daniel L. United States magnetic tables and magnetic charts for 1925. U. S. Coast and Geodetic Survey. Serial No. 453, 136 pages, 4 maps. Government Printing Office, Washington, D. C., price 60 cents. Contents: 1. Introduction, 2. Available data, 3. Secular change data, 4. Secular change tables, 5. Reduction to epoch, 6. Contents of table of results, 7. Accuracy of tabular values, 8. Construction of the magnetic charts, 9. Lines of equal annual change, 10. Results of observations at repeat stations, 11. Tables for reducing results to January 1, 1925, 12. Observed values of magnetic elements and corresponding values of January 1, 1925.

zareff, P. P. Successes of geophysics (in Russian). Government publishing office, Moscow - Leningrad, 1929, 83 pages, 44 figures. Price, one ruble (51 cents). Contents: Chapter I, Mathematical and experimental methods in geophysics; (a) general methods of the investigation of nature; (b) methods of studying the form and the movement of the earth. Chapter II, On the experimental study of the processes occurring in the earth's crust. Chapter III, Movements occurring in the gaseous and liquid envelope of the earth.

S. Coast and Geodetic Survey. Magnetic Declination in Delaware, Maryland, Virginia, West Virginia, Kentucky, and Tennessee. Serial No. 457, 112 pages, 2 maps. Government Printing Office, Washington, D. C., 1929, price 20 cents. Contents: 1. Introduction, 2. Compass surveys, 3. Explanation of map showing change in declination, 4. Secular change tables, 5. Use of isogonic chart.

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DEPARTMENT OF COMMERCE - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 15.

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

THE USE OF THE TORSION BALANCE IN THE INVESTIGATION OF GEOLOGICAL STRUCTURE

By W. F. P. McLintock and James Phemister

The Institution of Mining and Metallurgy, London. Transactions, vol. 38, 1929, pp. 299-303.

The form and distribution of the underground mass producing the gravitational disturbance and, hence, conclusions regarding the geological structure may be drawn by the determination by the torsion balance of the two following elements: (1) The gradient of gravity, and (2) the so-called horizontal directive tendency, H. D. T. or curvature vector. Eötvös' torsion balance enables these two elements of the gravitational field to be determined to an accuracy of 1 times 10^{-9} c.g.s. unit. According to the authors the most suitable areas for investigation by the Eötvös torsion balance are those characterized by: (1) A moderately flat surface topography (slopes not over 5°) and (2) a geological structure in which light and heavy rocks are brought into juxtaposition in such a way that the surface of separation between the light and heavy material is inclined to the horizontal.

Geological structures are divided by the authors, from the point of view of gravity surveying, into two classes: (1) Structures that can be determined by a straight line traverse across the strike (anticlines, synclines, dykes, faults, and lodes) and (2) structures that demand observations at a network of stations to determine even approximately their shape and dimensions (domes, basins, and intrusions whose length and breadth are comparable).

Three surveys completed by the Geological Survey with the Eötvös torsion balance are examined: (1) A gravitational survey over the Swynnerton Dyke; (2) a gravitational survey over the buried Kelvin Valley at Drumry, near Glasgow; and (3) localizing of a fault in carboniferous strata in the Edinburgh district.

In conclusion the authors say: "The results so far obtained by the Geological Survey with the Eötvös torsion balance have shown that the method is of considerable value in geological investigation. In suitable areas where the main features have already been determined by geological survey the balance may be of the greatest use in extending, detailing, and even correcting previous geological inferences. The Eötvös balance may also be used in prospecting for salt domes and large deposits of heavy minerals in areas where, by inference from the geology of adjacent areas, there is reasonable expectation of the presence of such structures and deposits."--W. Ayvazoglou.

FUNDAMENTAL PRINCIPLES OF THE GRAVITATIONAL METHOD OF PROSPECTING

By E. Lancaster-Jones

e Institution of Mining and Metallurgy, London, Transactions, vol. 38, 1929, . 304-308.

In this article the author reviews the conditions necessary for gravitional location of deposits and determines what prospects it has of successful ilization in the usual circumstances of occurrence of characteristic valuable posits.

The most important factors upon which the gravitational "effects" pend are usually the following:

1. The density of the deposit relative to its surroundings.

2. The size of the deposit (the product of the relative density and ze may be termed the "relative mass").

3. The nearest distance of approach to the deposit, which is usually e depth of the upper surface of the deposit below the surface of the earth.

For a very concentrated deposit of "relative mass" M metric tons and pth below the surface D meters, the extreme possible variation of the gravity adient effect is approximately 115 $\frac{M}{D^3}$ Eötvös units, whence it will be apparent at for a practical extreme variation of 5 units, 23 M must be not less than D^3. us, for a depth of 1 meter M must exceed 1/23 metric ton. The following more pendable estimate is given:

For a depth of 1 foot the relative mass should exceed 5 pounds.
For a depth of 10 feet the relative mass should exceed 2 tons.
For a depth of 100 feet the relative mass should exceed 2,000 tons.
For a depth of 1,000 feet the relative mass should exceed 2,000,000 tons.

a "bed" or "vein" formation the limiting relative masses must be increased.

As surface topography is an important source of disturbing effects, e gravity surveying is restricted to regions of comparatively low relief.

Other sources of disturbing effects are the local variations in the nsity of the upper portion of the ground in the neighborhood of the gravity serving stations and disturbing effects due to changes of density in the deeper rata which have no association with the valuable deposits sought.

The author summarizes the conditions favorable to the success of gravitational prospecting as follows:

1. The deposit sought should be of sufficient relative mass compared with its depth below the surface to give rise to variations in the Eötvös effects of at least 5 to 10 units.

2. The ground surface should be reasonably uniform and not interrupted by sudden upheavals or depressions, particularly in the neighborhood of the observing stations.

3. The "cover" should be homogeneous and preferably alluvial.

4. The subdrift topography should not be too irregular.

5. The strata should be evenly bedded, except where anomalies are associated with the deposit sought or are too deeply-seated to affect the observations.

In conclusion, Jones gives a few guiding factors relative to the cost of gravitational prospecting; for large-scale work in connection with extensive structures, a figure of £500 per month is regarded as a reasonable average cost for which about 100 stations could be expected. The cost of apparatus, which is £1,000 to £1,500 per instrument, must be added. In an "undeveloped" region of surveying, costs of transportation and maintenance of personnel and equipment must be taken into consideration.---W. Ayvazoglou.

GRAVITY EXPEDITION OF THE UNITED STATES NAVY

By F. A. Vening Meinesz

Nature, vol. 123, No. 3099, 1929, pp. 473-475.

The author describes the proceedings of the expedition carried out in the autumn of 1928 for determining gravity in the Gulf of Mexico and in the Carribean Sea. Observations were made on board a submarine. Two surface ships were added to the expedition. The total number of stations was 49. The pendulum apparatus was mounted in the central control room of the ship; the apparatus hung in gimbals which made it possible to work even if rolling or pitching was very great, say, 7°.

The apparatus used was constructed at the workshop of the Meteorological Institute at De Bilt (Holland). It consisted of a pendulum apparatus and a recording apparatus combined in one unit hung in gimbals. The pendulum apparatus contained three half-second pendulums swinging in the same plane; the pendulums were not recorded separately but combined in two pairs. The work and recording of the apparatus is described. Besides the pendulum observations a great number of soundings were taken.

The results of the gravity observations were provisionally computed uring the voyage and at the same time the isostatic reductions of the stations ere made at the Coast and Geodetic Survey. The final computations are now eing made at the Naval Observatory in Washington.

The author makes the following statements concerning the provisional esults. The Gulf of Mexico has shown a curious positive anomaly of about 60 illidynes over nearly its whole extent; a second result of importance was found orth of Porto Rico. It shows great departure from isostatic equilibrium, which robably may be ascribed to stresses working in the earth's crust in connection ith the formation of the deep. Over the deep is a great deficiency of gravity; efore reduction it was more than 300 millidynes and after isostatic reduction, bout 190 millidynes. North and south of the deep the anomaly after isostatic eduction is small; north of the deep it is slightly positive and south of it lightly negative.

The expedition must be considered important for geodetic and geophys- ical science, especially if these researches are continued.--W. Ayvazoglou.

ZUR DREIACHSIGKEIT DER ERDFIGUR UND BEGRÜNDUNG DER LEHRE VON DER ISOSTASIE

(ON THE 3-AXIAL FORM OF THE EARTH'S FIGURE AND THE BASIS OF THE THEORY OF ISOSTASY)

By F. Hopfner

hysikalische Zeitschrift, vol. 31, No. 7, 1930, pp. 289-296.

Fifteen years ago F. R. Helmert raised again the question on the 3- xial form of the earth's figure; since that time this question has been con- stantly discussed in the geodetical and geophysical literature.

After Helmert, A. Berroth and W. Heiskanan calculated the figures for he 3-axial earth from the gravity measurements available in their time. Heiskanan obtained, after the reduction of the observations for isostasy, 345 eters as the difference A-C of the two semiaxes of the equator; the great axis intersects the equator at the points 18° and 198° east longitude of Greenwich; for the oblateness of the earth a figure equal to 1/294.3 was obtained along he eighteenth degree of longitude and a figure equal to 1/299.0 along the one undred and ninety-eighth degree of longitude.

These results agree qualitatively with those obtained by Helmert and Berroth. They also have reduced the gravity measurements for isostasy. Both of hem reduced the gravity measurement values according to the so-called free-air formula (Freiluftformel) for the surface of the sea level; that is, they reduced the values observed as if the attraction of masses (continents) rising above this surface did not contribute anything to the observed, respectively reduced gravity values.

This process can evidently be based on the physical assumption that the visible surplus of masses is equalized by the invisible deficiency of masses; therefore, the reduction according to the free-air formula remains, although primitive, an isostatic reduction proceeding.

The satisfactory conformity of the results obtained caused the 3-axial form of the earth's figure to be almost accepted in spite of the existing contradiction between this result and the theory of the equilibrium figures.

The 3-axial form of the earth has been doubted in recent years by M. Bossolasco, K. Mader, and R. Schwinner, who base their doubt on important objections.

Although the question has not been clarified yet and has even been extended recently by Mader into an interesting alternating question, there is already a possibility for a conclusive decision on the 3-axial form of the earth's figure as accepted by Helmert, Berroth, and Heiskanen, if the decision is based on Bruns' mathematic-physical theory of the figure of the earth.--Author's abstract translated by W. Ayvazoglou.

2. MAGNETIC METHODS

THE MAGNETIC METHOD OF PROSPECTING

By Captain H. Shaw

The Institution of Mining and Metallurgy, London, Transactions, vol. 38, 1929, pp. 286-298.

After having mentioned a few historical data on the first magnetic observations and after a brief explanation of the principles of the work with a magnetic needle, Shaw discusses the magnetic method of prospecting under the following headings:

Measurements. Determination of the earth's magnetic field by measuring the declination, inclination, and intensity. Preferability for practical reasons of measuring the vertical and horizontal components of the earth's magnetic field. Instruments (magnetic variometers) by which these components may be determined with an accuracy between 5 gamma and 10 gamma.

Magnetic properties of rocks and minerals. Paramagnetic and diamagnetic bodies.

Permeability and Susceptibility. Explanation of these properties. A table showing the magnetic susceptibility and permeability of a number of rocks and minerals is given.

Local anomalies. Local and regional disturbances. Location of hidden tectonic structures such as anticlines, synclines, faults, monoclines, etc.

Results of typical surveys. Maps and explanations of the following ical examples are given: (1) Variation of the vertical component over a por- n of the Kursk anomaly in Russia; (2) variation of the horizontal component r a deposit of serpentine; (3) horizontal and vertical intensity curves and al disturbance vectors over a magnetite deposit near Berggiesshübel; (4) iation of the vertical component obtained by Hoiland over the salt deposits Lüneburg; and (5) horizontal and vertical intensity along a traverse across Panhandle Arch.

Limitations. The development of the magnetic method for the location weak anomalies requires a still further increase in the reliability and the uracy of measurement of field instruments. By careful handling and under orable conditions the author considers work with an accuracy of ± 5 gamma ssible, but in general the mean error will be nearer ± 10 to ± 15 gamma.

Interpretation. Difficulties of the interpretation of magnetic irregu- ities are discussed and the necessity of borings for a complete interpretation the results is pointed out.

Field operations. In prospecting for metalliferous minerals the mag- ic method is considered by the author as the most rapid and least expensive all the geophysical methods because it may be employed in hilly country, on t swampy ground, or even in densely wooded areas. The time required for the upation of each station with a modern instrument is estimated as 15 to 20 utes, and the operating costs in a country which is not too densely wooded which does not present transport difficulties ranges from 0 to £150 per month.--W. Ayvazoglou.

MAGNETIC DECLINATIONS AS ESTABLISHED AT THE OBSERVATORY OF STARA DALA DURING 1927-1928.

By V. Laska

stitut Géophysique National Tchécoslovaque, Bulletin Magnetique, vol. 1, No. 1, 29, 24 pp.

This is the first number of the new periodical "Bulletin Magnetique," sued by the Institute. The purpose of the magazine is to give detailed mag- tic data obtained by observations made in the observatories of the Republic. this first number the director of the Institut, Prof. Dr. V. Laska, gives ta of magnetic declinations established at the observatory of Stara Dala during 27-1928. The position of this observatory is as follows: Latitude, 47° 52.5' longitude, 18° 11.4' E.--W. Ayvazoglou.

MAGNETIC DECLINATIONS IN BOHEMIA FOR THE EPOCH 1925.5

By Fr. Cechura

Rozpravy II, Tridy Ceske Akademie, vol. 39, No. 6, 1929, pp. 1-23.

In this article the author represents the results of the measurement of magnetic declinations (published in the same magazine, vol. 36, No. 35, 192 in a map of isogons and in the form of empiric formulas of values of declinati

At the end of the article relations between the isogons and isonomal and between the geology and tectonic of the region of Bohemia are examined.— W. Ayvazoglou.

MAGNETIC DECLINATION IN MORAVIA-SILESIA REDUCED TO EPOCH OF 1925.5

By Fr. Cechura

Rozpravy II, Tridy Ceske Akademie, vol. 39, No. 53, 1929, pp. 1-30.

In this article the author publishes values of magnetic declinations obtained by a magnetic survey in Moravia and Silesia in 1928 for 41 stations. these values were reduced to the epoch of 1925 to 1926 in conformity with the results of the previous work.

This article is completed by a table containing the elements necessa for making these reductions and for obtaining a general view on the magnetic f in Moravia and Silesia. These two countries, being situated between the Bohem and Carpathian mountains, occupy a territory which is disturbed not only from viewpoint of tectonic but also with relation to the magnetic field.—W. Ayvazo

3. SEISMIC METHODS

Seismic Methods

By A. O. Rankine

The Institution of Mining and Metallurgy, London, Transactions, vol. 38, 1929, pp. 309-322.

The question to be answered in this article is "How does a seismogra by recording the times of arrival of the disturbances transmitted to it throug the earth from an explosion, make it possible to estimate the depths and shape the interfaces between strata of different materials?"

The fundamental requirement as regards the physical properties of th media above and below the interface which it is desired to locate by the seism method is that the velocity of longitudinal disturbances must be less above th interface than below it.

A simple case, namely, a horizontal interface below the earth's sur-
e at a depth h is examined and it is shown how this depth h can be calculated.
e structure chosen for this calculation is the simplest possible one. It
phasizes, however, the fundamental principle upon which the seismic method is
sed, that is, the elucidation of underground structure by examination and in-
rpretation of the time-graphs of "initial" disturbances received by seismo-
aphs and, more particularly, the discontinuities shown by these curves. More
mplicated cases arise, of course, in practice. The interface may be sloping
stead of horizontal; it may not be plane, or it may have abrupt changes of
rections, as in faults; and there may be more than two superposed strata.
ese complications introduce new unknown variables besides the depth, whose
fects can be worked out theoretically. To deal with these additional features
practice it is necessary to increase the observation points and to change
th the position of the explosion point and the direction of the observation
ne.

A series of diagrams, prepared by the author, illustrates the procedure.
e diagrams represent:

1. The way in which the range for time equality increases with the
pth of a horizontal interface; the two distances are proportional one to
other.

2. The effect on the time-distance graph of changes in the ratio of
e velocities below and above the interface.

3. The two next figures show that a sloping interface may give a
aph identical with a horizontal one of a different velocity ratio.

4. The same fact is indicated in the two next figures in which the
ring point is altered and the direction of observation reversed.

5. Two following figures exhibit the effect of pitch of the interface,
e first showing that when the slope downwards becomes greater the break in the
aph becomes less marked and more remote from the origin and the second demon-
rating the possibility of a negative slope in the second branch of the graph
rresponding to an apparently negative surface velocity.

6. The following three diagrams illustrate respectively the effects
be expected over a vertical fault and interface which dips abruptly but
ntly and a symmetrical anticline with flanks making a small angle with the
rizontal.

7. The last diagram shows the calculated results for three strata
parated by horizontal interfaces.

In conclusion Rankine points out that the chief advantage of the seis-
c method over the gravity method is the relative rapidity with which both

field observations and calculations can be obtained; therefore, the seismograph should be regarded as the pioneer, to be followed, if desirable and possible, by the torsion balance to secure more exact information.—W. Ayvazoglou.

PHYSICS IN RELATION TO OIL FINDING

By A. O. Rankine

Nature, vol. 123, Nos. 3105 and 3106, 1929, pp. 684-686 and 718-720.

After a few introductory words on the task and possibilities of geophysical prospecting in general, Rankine gives an account of the seismic method of locating structures likely to be oil-bearing. This method can be applied even in rough country where gravity measurements are too much distorted by surface effects to give reliable indications of underground conditions. It depends not only on the relative densities but also on the relative elasticities of the rocks encountered or, what amounts to the same thing, the speeds of propagation of longitudinal mechanical disturbances in these media. These velocities range from about 5,300 meters per second for salt to about 2,000 meters per second for clay and sand overlying the dome.

One may perhaps digress for a moment to consider the possibility of using direct reflection from a clay-salt interface as a means of determining its depth. If a device similar to the depth-sounding machine, which has been successful at sea, could be used its great advantage would be that the measurement of the time taken for the sound to go down to the interface and return by normal reflection would enable the local depth to be estimated. The method proved unsuccessful in practice, however, because of the enormous damping of vibrations of audible frequency in the upper layers of the earth.

Thus, great disturbances of the earth's surface, generally in the nature of explosions, are necessary to penetrate effectively to the depths at which oil-bearing structures are frequently found. Therefore, a seismograph which will record vibrations of low inaudible frequency is preferable to the microphone on account of the smaller damping of such vibrations.

Using an explosion involves a difficulty on account of the appreciable time the consequent disturbance of the earth lasts. The solution to this difficulty lies in the existence in practice of another disturbance associated with a lower (higher velocity) medium but distinct from the reflected disturbance, which may, at a sufficient distance from the explosion, reach the seismograph first. Although small, the time of arrival of this disturbance can be readily recognized as it makes its record on the seismograph before the latter becomes violently disturbed by the direct waves.

The author discusses a simple case of two superposed horizontal strata in which the velocities of compressional waves are V_1 and V_2, the latter corresponding to the lower medium and being greater than V_1. If an explosion is caused at a certain point, three distinct disturbances reach the seismograph. One good

rect to the seismograph; another is reflected from the lower medium and rives later, as its path is longer; and the remaining disturbance arrives at e seismograph at a time corresponding to the equivalent path from the point explosion to the lower medium at the critical angle, $\theta_c = \sin^{-1} \frac{V_1}{V_2}$, en along the junction of the strata, traveling finally at the same critical gle up to the instrument. As V_2 (the velocity in the lower stratum) is the gher, it is evident that if the distance from explosion to instrument is eat enough the total time occupied in transmission may be equal to or less an that for the direct path. If so, its small effect will be recognizable the seismograph in spite of the large disturbance which follows afterwards. a time graph is plotted, with the intervals between the instant of explosion d that of the initial disturbance of the seismograph as ordinates and the stances between explosion and seismograph as abscissae, it will display a eak where the times of arrival of direct and indirect disturbances are equal. tually, the distance x for time equality is related to the depth of interce by the relation $\frac{h}{x} = \frac{1 - \sin \theta_c}{2 \cos \theta_c}$.

Moreover, the slope which corresponds to the direct disturbance is roportional to $\frac{1}{V_1}$, while the slope which relates to the indirect disturbance proportional to $\frac{1}{V_2}$. Thus, $\sin \theta_c = \frac{V_1}{V_2}$. Hence θ_c can be determined d its insertion in the above equation, with the value of x, read from the aph, enables the depth h of the interface to be calculated. Owing to its gnitude it is possible to recognize on the seismograms the arrival of the rect disturbance even when it reaches the seismograph after the indirect sturbance.

In all cases the procedure has to consist of the assumption of various ssible underground structures until one is found which, by calculation, agrees th the time graphs actually obtained.

For this purpose it is frequently necessary to multiply observations y changing the position of the explosion point and the direction of the line f observation. The accumulation of field data over various structures also viously facilitates the recognition of similar structures in subsequent surys. Where, as often happens, the salt domes or limestone anticlines are deepr buried, large charges must be exploded because of the long ranges that must e covered to reach and pass beyond the point of time equality -- an essential ndition if the depth is to be determined. Consequently, it is economical to ltiply the number of seismographs rather than the explosions. For celerity f survey the seismographs must be readily portable and easily set up in their w positions.

A group of five seismographs obtained with Mintrop seismographs over salt dome is given.--W. Ayvazoglou.

LIST OF EARTHQUAKES IN THE BOHEMIAN MASSIF TO THE YEAR OF 1896 (IN BOHEMIAN)

By Em. Michal

Institut Geophysique National Tchecoslovaque, Bulletin Sismique, vol. 2, No. 1 1928, 15 pp.

The Institute of Geophysics in Czechoslovakia is preparing a series of studies of earthquakes which have occurred on the territory of the Republic. In this first part of the work Michal gives a complete list of earthquakes from 768 to 1896. Historical material as well as seismic maps will appear in the following issues.—W. Ayvazoglou.

4. ELECTRICAL METHODS

ELECTRICAL PROSPECTING FOR ORE AND OIL

By Hans Lundberg

Mining and Metallurgy, vol. 11, No. 280, 1930, pp. 210-212.

In this article Lundberg discusses the use of electrical methods with special reference to the prospecting for ore bodies and the mapping of geologic structure. As the success of electrical prospecting depends on the differences in conductivity between the ore and the country rock, which varies considerably in different places, the conductivity of the two should be considered and determined if possible. Methods of identifying noncommercial conductors are of great importance; therefore, it is not sufficient to confine the electrical work to a mere location of an electrical disturbance and leave the interpretation to the geologist or mining engineer, as he may find nothing but a valueless mineralization of conductive rock.

In discussing the depth which can be measured by electrical methods, Lundberg says that theoretically there is no limit to the depth at which the body may be detectable by assuming that all its dimensions increase proportionally with the depth but that, practically, the maximum depth at which reliable results can be expected is 200 to 300 feet. The one solution of the problem of obtaining greater depths is to get down deeper with the apparatus, a solution that may be reached by grounding electrodes in deep drill holes, working in underground drifts, etc.

The cost of electrical surveys, if compared with other methods of exploring, must be considered cheap and is, according to Lundberg's experience, about $6.00 per acre for the primary or reconnaissance survey.

The last paragraph of the article deals with "mapping subsurface structure." This has its main use in prospecting for oil and salt. By assuming the simplest case for electromagnetic structural work, the case with only one conducting bed and the other beds very poor conductors, determining the depth of the conducting bed is then sufficient to make a subsurface contour map of

e bed. The depth that can be reached depends on conditions, but results from 500 feet were actually obtained by the survey work made by the author. In eaking of the cost of survey in most petroleum regions the author says that ,000 acres can be prospected per month at a cost of about $0.75 per acre.--- Ayvazoglou.

BSERVED AND THEORETICAL ELECTROMAGNETIC MODEL RESPONSE OF CONDUCTING SPHERES

By L. B. Slichter

e American Institute of Mining and Metallurgical Engineers, Technical Publica- on No. 332, 1930, 19 pp.

After stating the principles of similitude which apply to electro- gnetic modeling, the author gives charts showing the inductive response of nducting spheres as dependent on frequency, conductivity, and size. The shape the curve, which relates intensity of response to frequency, is significant indicating the advisability of low frequencies in the exploration for con- cting bodies, when consistent with securing a large percentage of the ideally ssible response. Comparisons of theoretical response and that observed with dels are shown, and relationships with the subject of applied electromagnetic specting are indicated.--Author's abstract.

ELECTRICAL PROSPECTING

By A. Broughton Edge

e Institution of Mining and Metallurgy, London, Transactions, vol. 38, 1929, . 323-334.

A summary account of the working principles on which the more import- t geoelectrical methods of prospecting are based is given in this article. eir particular merits and limitations are discussed.

The following electrical methods are examined:

1. Resistivity methods. In particular the 4-electrode method of arle and Winner, developed by the Carnegie Institution and others, is men- oned. The author draws the conclusion that the resistivity methods may be of re direct value in the investigation of water problems (depth of water table, linity, etc.), thickness of superficial deposits (clays, laterites, etc.), d determination of the depth of a conductive body which has been located by me other method.

2. Equipotential methods. The distribution of current is mapped in simple manner by tracing the equipotential lines by means of a light movable rcuit consisting of a sensitive galvanometer and a pair of nonpolarizing elec- odes or, in case of alternating current (about 500 cycles), of a telephone d amplifier and a pair of pointed steel rods.

3. Electromagnetic methods. In these methods, which constitute probably the most important group, single-phase alternating currents are either passed through the ground between earthed electrodes, as in the equipotential method, or are produced inductively by means of loops of insulated wire which may be placed on the ground in a horizontal position, thus producing vertical fields, or in vertical position, thus producing horizontal fields.

4. Spontaneous polarization method. This method depends on the fact that electrochemical differences of potential are generated naturally in certain types of ore bodies in which oxidation of the mineral is in progress. In this way a well-defined circulation of current is set up in the surrounding country and, by mapping its distribution at the surface, the position of the concealed ore may sometimes be determined.

In discussing practical limitations of the electrical prospecting methods the author expresses the opinion that there is no convincing evidence so far to suggest that any of these methods are effective in locating mineral at depths from the surface exceeding 500 feet. It is also understood that the useful application of the electrical methods, in their present state of development, is definitely restricted to certain classes of mineral deposits.

The following considerations are of major importance:

1. It is not practicable to conduct electrical prospecting operations except in districts where mineralization of known characteristics has already been proved at some point.

2. The nature of the ore minerals and the physical character of the ore, in so far as they affect the electrical conductivity of the ore bodies which are to be located, are of primary importance.

3. The effectiveness of the methods is also determined to a great extent by the nature of the inclosing and overlying country rocks.

Under the heading field operations Edge says a few words regarding the general nature of the work in which he gives some idea of the scale and expense of those operations. As a rule a single prospecting unit will consist of two operators with field instruments and auxiliary equipment to the approximate value of £600. The traveling expenses and salaries of these men must be borne in mind, also several kinds of overhead charges. According to the author a three months' field work by a single prospecting unit involves a total expenditure of from £2,500 to £3,000.

Interpretation and proving the results forms the last chapter of the article. In the opinion of the author the interpretation of results requires considerable skill and experience; in the majority of cases approximate determinations of the depth and extent of concealed conductors may sometimes be made with errors of not more than 10 per cent. In their present state of development all that can reasonably be claimed for the electrical methods is: (1) That the

re able to locate conductive zones lying at depths up to a few hundred feet
ıd (2) that the depth and horizontal extent of these conductors can sometimes
e determined with considerable accuracy.--W. Ayvazoglou.

PROSPECTING BY THE SWEDISH GEOELECTRICAL METHODS

By Karl Sundberg

ıe Institution of Mining and Metallurgy, London, Transactions, vol. 38, 1929,
. 335-354.

After a brief historical description of geoelectrical methods of pros-
ecting Sundberg gives an outline of:

1. The principle of the geoelectrical method.

2. Electrical conductivity of rocks in oil districts and relation be-
ween configuration of waters and geological structure.

3. Practical results.

The case of one conducting layer is discussed and illustrated by fig-
res. As several conducting layers below each other generally must be taken into
onsideration, the elimination of the influence of conducting beds close to the
urface is important. The theoretical problem of calculating the magnetic field
or any number of conducting beds above each other has been solved. The reverse
roblem of finding the configuration of several beds is more complicated, the
omplication being more serious the larger the number of beds to be taken into
onsideration.

Before giving practical results of geoelectrical prospecting Sundberg
iscusses briefly the factors that determine the electrical conductivity of rocks,
ith special reference to the question, fundamental for geoelectrical structure
ork, of whether or not an horizon of certain electrical conductivity parallels
he geological structure. The electrical conductivity of the rocks, which are
ll more or less porous, the pores being partly or completely filled with water,
il, or gas, is determined by the following two factors:

1. Percentage volume v of water in the rock.

2. Specific resistance r of water in the pores.

In a table the average pore volume and water content for different rock
ypes are given. Another table, given below, shows the magnitude of the specific
esistance of different rocks established according to the present knowledge.

Specific Resistance (ohms per cubic centimeter)

Rock	Pores filled with surface or ground water	Pores filled with salt water
Limestone and sandstone	100,000 - 1,000,000	500 - 5,000
Sand and clay	40,000 - 400,000	200 - 2,000
Marl, "Loess"	2,000 - 20,000	20 - 200

The variation in electrical properties is thus large enough to make a large contrast possible between a certain bed as compared with any other. A geoelectrical survey is more likely to give good results the more pronounced this contrast is.

Sundberg states that only a few of the practical results can be given because most of his work has been carried out with the condition that the results shall not be published.

The results of geological and geoelectrical investigation of the Lanzendorf area close to Vienna are shown in the accompanying map. The geological and geoelectrical investigations were carried out independently by different persons but agree very well, although the electrical results are apparently much more detailed than the geological. Two other figures show the example of a tectonic survey. The problem was to locate faults. Some of them were located. In the last figure the results from geoelectrical mapping of a dome, confirmed by a later drilling, are shown.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

THE SENSITIVE SURFACE OF THE GEIGER TUBE ELECTRON COUNTER

By L. F. Curtiss

Bureau of Standards Journal of Research, vol. 4, No. 5, 1930, pp. 601-609.

Experiments with the new Geiger tube electron counter show that no preparation of the central wire electrode is necessary, which contradicts results reported by Geiger.

Such wires as bare copper, bare steel, lacquered steel, oxidized tungsten, and oxidized nichrome work satisfactorily. All of these wires cease to work when such gases as H_2S, SO_2, ethylene, or water vapor are admitted. This shows that at the pressure at which these counters work enough oxygen is absorbed to permit the counter to operate. When another gas with different absorptive properties is admitted the counter can no longer function.--Author's abstract.

EXPERIMENTAL INVESTIGATION OF THE ELECTRON COUNTER

By H. Geiger and W. Müller

ysikalische Zeitschrift, vol. 30, August, 1929, pp. 489-493.

The authors have already described an electron counter which may be ed for the quantitative investigation of extremely weak radiations of either omic or corpuscular nature. The apparatus consists simply of a metal tube th an axial fine wire whose surface is coated with a half-insulating skin. In nsequence of this skin the potential on the wire may be raised so high that on e entry of even weak beta radiation the ionization by collision makes it easy observe the incidence of the beta radiation with an instrument of normal sensi- vity. The present series of experiments was made to test the working of the unter under various conditions.

It is shown that the number of secondary beta rays observed when weak mma rays fall on the counter is practically constant as soon as the pressure creases to more than 5 cm. of mercury. Even at 1 mm. of pressure, however, a nsiderable fraction of the maximum number of particles is observed.

The effects of varying the type of gas (A, H_2, air, CO_2) and the di- eter of the central wire are discussed. The number of observed impulses per nute over a considerable voltage range with a "good" wire remains constant ,300 to 1,600 volts). Practical hints for the detection of "good" and "bad" bres are given. The sensitivity of a counter along the length of its axis was vestigated by using a narrow bundle of beta rays from RaD + E. The sensitivity mains constant over most of its length but drops near the insulators at the ds of the tube. Experiments with tubes of various materials (paraffin, Al, Fe, , brass, Zn, lead) show only small variations except in the case of lead. The rectional effects of the secondary beta rays produced by gamma rays may be sily demonstrated. For cosmic rays such asymmetry is not observed as would be pected if they are indeed corpuscular as suggested by Bothe and Kohlhörster. perimental evidence is marshalled to show that the counter records all of the ta rays falling on it. The paper contains much useful experimental information d should be consulted for details.--Reprinted from Science Abstracts, Sec. A., l. 33, No. 387, 1930, p. 291.

NATURE OF COSMIC RAYS

By P. Auger and D. Skobelzyn

mptes Rendus, vol. 189, July 1, 1929, pp. 55-57.

The suggestion put forward by Bothe and Kolhörster that cosmic rays are reality not gamma rays but high-speed beta rays is shown to be inconsistent ith the results of certain expansion chamber experiments.

These experiments show the immediate cause of the ionization produced to be high-speed beta rays, but the frequent occurrence (four times out of 27 "fruitful" expansions) of several high-speed beta ray tracks in one expansion, the tracks being near together and having almost the same directions, makes it almost certain that they arise in common from a ray of another character. Assuming the cosmic rays to be of gamma ray type and the high-speed beta rays to be Compton electrons produced by Compton scattering of the primary cosmic ray, the observed results are easily explained.--Reprinted from Science Abstracts, Sec. A., vol. 33, No. 385, 1930, p. 59.

7. UNCLASSIFIED METHODS

ECHO SOUNDING

By H. Maurer

Hydrographic Review, vol. 6, No. 2, 1929, pp. 21-28.

During the cruise of the German vessel Meteor in the Atlantic Ocean 67,000 soundings at 34,000 stations were taken. In this article Maurer brings up the question as to how they should be treated. In the experience of the Meteor the depths were frequently much greater than the echo distances. Out of 245 comparisons of depths of over 2,000 meters 56 cases gave a difference exceeding 100 meters, and the maximum difference amounted to 650 meters when the wire gave 4,840 meters depth. To calculate the true echo distance, the mean velocity of sound between the ship and the bottom must be known. It varies according to the temperature, salinity, and pressure (from 1,400 meters per second in cold fresh water to 1,620 meters per second at the bottom in the greatest depth). By means of the "Tables of the velocity of sound in pure water and sea-water for use in echo-sounding and sound-ranging," issued by the British Admiralty in 1927 under the number H. D. 282, it is possible to calculate the mean velocity in any column of water between the surface and the bottom at any place where the range of the temperature and salinity in the column is known.

On German charts the results of sonic sounding (over 200 meters) are entered as echo distances, all of which are deduced from one constant velocity (1,490 meters per second) on which all German echo-sounding machines are based. With reference to the Meteor's soundings, 7,000 stations have been inserted on the charts and the average horizontal distance between stations is 10 sea miles. The crude echo distances calculated on a single constant velocity are the most useful not only for the seaman but also for science as they can be corrected according to the most recent data available. Results of echo sounding given in the form of depths without indication of the velocity on which they are based are useless to accurate science.--W. Ayvazoglou.

GEOPHYSICS EDUCATION

By C. A. Heiland

ining and Metallurgy, vol. 11, No. 281, 1930, pp. 250-251.

In this article Heiland discusses briefly the question of providing men ell trained in geophysical prospecting. This subject is presented by the author three ways: (1) The trade school idea, (2) the pure science idea, and (3) the gineering idea; the last being in his opinion the superior one.

The method of instruction adopted at the Colorado School of Mines is iven. The men to be trained in geophysics are required to take almost all the ork required of the geological engineer; they also take one course in geophysical thematics and one course in advanced physics in their third year, two general eophysical courses, and at least two special geophysical courses in their last chool year. To obtain a M.S. or Sc.D. degree with a major in geophysics, advanced ourses in geology, physics, and mathematics should also be taken.—W. Ayvazoglou.

GEOPHYSICS

By W. H. Fordham

ournal of the Institution of Petroleum Technologists, vol. 18, No. 80, 1930, . 97-107.

Fordham gives a brief account of a series of articles showing the esults of geophysical work during the last years. Instruments, theory, practical pplication, and results of gravimetrical, seismic, magnetic, and electric methods f prospecting are discussed.

To show the growth of geophysical work in the United States, Fordham ives some figures on the number of instruments used: (1) The first four torsion alances were imported into the States in 1922 and within two years, 1924 to 1926, heir number increased to more than 100; (2) the number of seismic troops in the ield in 1929 is given as 28; and (3) the number of magnetometers in use has in- reased to more than 300.

In conclusion Fordham summarizes the cost of surveying as given by sev- ral authors:

"Barton gives the cost of running a single torsion balance at $1,200 a onth, during which 50 stations should be done. With the gradiometer a very much arger number of stations could be completed per month.

"Barton says that the cost of operating a standard seismic troop in the ulf Coast salt dome area is reported to average between $15,000 and $20,000 a onth.

"Spraragen estimates that the salaries and running expenses of a 3-instrument magnetic survey party amounts to $1,700 a month, 75 stations a day being done on the average, in 5 days each week. This estimation does not include depreciation of instruments.

"Edge considers that three months' field work with an electrical unit consisting of two operators and equipment, would probably involve a total expenditure of £ 2,500 to £3,000."

A list of articles used by the author as references is added.— W.Ayvazoglou.

GEOPHYSICAL SURVEYING

By W. H. Fordham

Journal of the Institution of Petroleum Technologists, vol. 15, No. 72, 1929, pp. 35-66.

After a brief explanation of the expression "geophysical surveying" which is formulated as "the application of physical measurements made, in most cases, on the surface of the earth to the discovery and mapping of hidden geological structures and mineral deposits," the author explains the nature and the use of geophysical instruments in the gravimetric, seismic, magnetic, and electric methods of prospecting. The value of geophysics in the search for oil by these methods and the cost of surveying are discussed under special headings. In conclusion the author says:

"From the results described in the present paper it is evident that geophysical methods are already proving a valuable aid to the geologist; and it is reasonable to look forward to a time when the subject will be an important branch of geology.

"The limitations both of the methods and of interpreters are becoming better understood, at any rate in the United States."

On the question of interpretation Fordham refers to the following statement of Dr. Barton, concerning especially the gravimetric method:

"To get the most out of torsion balance surveys, the interpreter should be a good mathematician and geologist, should have had a chance to study the mathematics of interpretation, and should have had a broad practical experience with the method. There are very few men who have had sufficient opportunity to study the mathematics of the interpretation and who have had sufficiently broad experience to qualify as competent interpreters. It is and will be easy to get men who are able and competent observers and who possess a fair but superficial knowledge of interpretation. A great danger to the full realization of the possibilities of the method is that the company employing such a man as an interpreter may fail to recognize his limitations. Another danger is that a company that realizes the necessity of training itself and its interpreter by theoretical st

d practical experience will become overimpatient and overonthusiastic and y force him to practical utilization of the method before he is competent to e it. A company that has had much experience with geology has become educated the fact that geology is not a 'sure-shot' panacea for finding oil and is tisfied to allow geology a considerable number of failures if it turns up a ir number of successes; but there is a good possibility that the same company ll condemn the torsion balance after a very few failures, without regard to ether the failures were due to the method or to the incompetence or inex- rience of the interpreter."

Another obstacle to the wider application of geophysics, mentioned by e author, is the lack of knowledge of results already obtained; thus, the tablishment of a Geophysical Institute that would keep a record of the work king place throughout the world and insure the necessary liaison between ysicists, instrument makers, and geologists would facilitate the development geophysical methods on sound lines.

A bibliography of articles on geophysical methods of prospecting is ided.—W. Ayvazoglou.

8. GEOLOGY

THE RECENT ACTIVITIES OF THE GEOLOGICAL COMMITTEE OF THE U. S. S. R.

By D. Mushketov

conomic Geology, vol. 24, No. 8, 1929, pp. 860-866.

A brief account of the work of the Geological Committee in the U. S. R. is given. According to the author the number of field expeditions reached 28 as compared with 389 for the previous year (1929).

Systematic study of the geological structure has been conducted over st parts of the Union.

Field study of the following mineral deposits has been carried on:

Iron.- Diamond drilling in Krivoy Rog, 802 meters deep, increased the tal reserves to 61,000,000 tons. A magnetometer survey disclosed many new omalies. The reserves established in the region of Kertch amount to 002,000,000 tons.

Manganese.- Preliminary reserves in the Nicopol region were estimated 83,000,000 tons; those in the Achinsk region, Siberia, at 1,000,000 tons.

Tungsten.- Deposits containing several hundred tons have been revealed Sherlov Mountain.

Nickel.- Tulenevsky deposit (Ural) revealed an additional reserve of 3 per cent ore. A new deposit, that of Krestinski, delimited an area of about 8,000 sq. km. with ore averaging 3 per cent.

Copper.- New ore bodies have been discovered in the Arshinsk deposit. Porphyry-copper deposits have been discovered in the Kazakstan Republic, Central Asia.

Lead.- A new fluorite-barite lode with a reserve of 20,000 tons of lead has been discovered in the Uzbekistan Republic, Central Asia.

Tin.- A number of new deposits have been discovered in Transbaikalia.

Gold and Platinum.- The discovery of gold placers of industrial value in the Yakutian Republic along the Ur-Kuma River and in the Cheremnaya River basin is mentioned. A new deposit containing 12 lodes has been discovered in the Saralinsk region, Siberia. A part of these discoveries is due to electrical methods of prospecting.

Asbestos.- An industrial quality of asbestos has been proved in two deposits, Gondurikhinski in the Ural and Aspaganski in Siboria.

Sulphur.- Preliminary reserves of 30 per cent sulphur ore amounting to 375,000 tons have been defined in Turkmenistan.

Potassium.- The probable total reserves in the Ural province potassium salt areas are estimated to be 900,000,000 tons.

Coal.- A new deposit of about 9,000,000 tons has been revealed in the Moscow basin. The reserves of minable coking coal at Tkvarcheli (Abkhasian Republic) amount to 110,000,000 tons. Several prospecting parties worked in the Far East.

Oil.- Oil investigations consisted of a systematic study of structures in oil-bearing regions and of prospecting for new deposits.

Prospecting.- Attention is called to the special geological work related to prospecting which consisted of drilling and mining work as well as the use of geophysical methods. Seventy-three parties were engaged in drilling; 52 parties carried on the mining field work, and 32 parties used geophysical methods.

Topographic work.- The areas covered by instrumental work were 15,795 sq. km. and by partly instrumental survey, 16,278 sq. km.--W. Ayvazoglou.

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GEOPHYSICAL ABSTRACTS[1]

No. 16.

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

ISOSTASIA ED ONDULAZIONI DEL GEOIDE IN RAPPORTS ALLE ANOMALIE GRAVIMETRICHE ED ALLE DEVIACIONI DELLA VERTICALE

(ISOSTASY AND UNDULATIONS OF THE GEOID WITH RELATION TO THE GRAVIMETRIC ANOMALIES AND DEVIATION FROM THE VERTICAL)

By Mario Bossolasco

Gerlands Beitrage zur Geophysik, vol. 26, No. 1, 1930, pp. 14-26.

The author examines the consequences resulting from the negligence of Bruns' terms in the proceedings used, so far, for the derivation of empirical formulas by Helmert, Hayford, Heiskanan, etc.; he comes to the conclusions tha the importance and validity of these formulas are considerably restricted by t negligence. Furthermore, the gravity disturbances g- γ' can not be brought int relation with the true figure of the geoid and the position of the equatorial ellipse established by rough approximation of the geoid as a three axial ellip is correct.

The author shows a simple and practical method of obtaining by measure of gravity the true figure of the the geoid, that is, its undulations relating referred ellipsoid. Finally, in discussing the deviations from the vertical, makes clear the uncertainty of the method used ordinarily for computing topogr deviations from the vertical. From all of these considerations he draws the c clusion that any positive geodetic basis for the isostatic theories is lacking Author's abstract translated by W. Ayvazoglou.

TEMPERATURE CHANGES BETWEEN TORSION BALANCE READINGS IN THE STATE OF TEXAS

By Sidon Harris

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 171-172.

The purpose of this investigation was to determine the magnitudes of t temperature changes between readings of torsion balances in the State of Texas through the entire year. The period of investigation extends from September, to February, 1930. A total of 14,799 readings was taken. A table shows the p centage of readings falling within the indicated increments.

Considering the average values for the entire investigation, the autho states that roughly 90 per cent of the readings give temperature increments sm than 2.5° C.; in other words, in 90 per cent of the readings the temperature c less than 2.5° C. in 40 minutes. It is apparent from these results that any geophysical instrument whose reading is affected by temperature changes must b designated to stand a break of 3° C. in 40 minutes to be of practical use in Texas.--W. Ayvazoglou.

UEBER ISOSTATISCHE SCHWEREANOMALIEN UND DEREN BEZIEHUNG ZU DEN TOTALEN ANOMALIEN

(ON THE ISOSTATIC GRAVITY ANOMALIES AND THEIR RELATION TO THE TOTAL ANOMALIES)

By Heinrich Jung

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 173-178.

Taking into consideration the fact that the expression "isostatic reduction", which various gravity reductions in connection with the principles of isostasy e known, is often misunderstood and causes confusion, Jung in this article sub- ts the isostatic principles on which E. A. Ansel's isostatic anomalies are based a close examination and compares them with the known isostatic reductions, pecially with those worked out by Hayford.

He examines also the limits of the validity of the following relation cal- lated by Ansel: $\frac{\Delta Gis}{\Delta G'o} \quad \frac{\varepsilon' - \varepsilon}{\varepsilon}$ in which ε' is the density of the subcrustal terial and ε the mean density of the mass of earth.--W. Ayvazoglou.

SCHWERE UND DRUCK IM ERDINNERN

(GRAVITY AND PRESSURE INSIDE OF THE EARTH)

By B. Gutenberg

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 37-41.

The author calculates gravity and pressure inside of the earth under ifferent assumptions of density.

Formulas are derived and the corresponding curves for gravity acceleration d pressure under three different assumptions of density are shown in two figures. nally Gutenberg examines the change of gravity in the earth's crust.-- Ayvazoglou.

SCHWEREREDUCTION UND DREIACHSIGKEIT

(GRAVITY REDUCTION AND THREE AXIALITY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 51-57.

Observed values of gravity are reduced by the isostatic method to levels of ifferent potential, according to the elevation of the observed station above sea evel. The same is true for Bouguer's and for free-air methods of reduction. All

of these methods of reduction do not answer the purpose for which they are projected. Results free from objections from the viewpoint of the potential theory can not therefore be expected when observed values are reduced according one of these methods.--Author's abstract.

ISOSTASIE UND SCHWEREANOMALIEN

(ISOSTASY AND GRAVITY ANOMALIES)

By W. Heiskanen

Gerlands Beitrage zur Geophysik, vol. 26, No. 1, 1930, pp. 42-50.

In this article the author proves by several examples that Hopfner has mistaken in his last papers on the reduction of gravity and on the figure of the earth (Gerlands Beitrage zur Geophysik, vol. 24, No. 4, pp. 378-379 and vol. 25 No. 1, pp. 81-84), that the gravity anomalies noticed and the deflections from vertical can not be explained by Bruns' term, and that the warping of the geoid according to observations is much smaller than Hopfner would have it. Prey's reduction is also dealt with in the article.--W. Ayvazoglou.

2. MAGNETIC METHODS

UEBER DIE URSACHE DER ERDMAGNETISCHEN STÖRUNG IM GEBIET DER FREIEN STADT DANZIG

(THE REASON OF THE EARTH MAGNETIC DISTURBANCE IN THE REGION OF THE FREE CITY OF DANZIG)

By H. Haalck

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 129-134.

The magnetic survey of the very distinct local anomaly which extends, in the region of the Free City of Danzig, from southeast to northwest has been made Fr. Errulat (Erdmagnetische Messungen im Gebiete der Freien Stadt Danzig. Mitteilungen der Geophysik. Warte der Universität Koenigsberg, 1929). He measured the distribution of the horizontal and vertical intensities as well as the declination. The stations were chosen sufficiently close, so that the value and the direction of the disturbance is well known.

The purpose of this article is to give the geological reason for this disturbance, which is not explained by Errulat.

The author examines a profile running perpendicular to the direction of disturbance. According to the disturbance curves obtained he concludes that the reason for the disturbance must be assigned to masses situated at great depths. Geologically the most probable cause is the existence of crystalline primitive rocks. Haalck shows that no other explanation is probable.

In view of the fact that the Danzig anomaly is caused by crystalline masses following two possibilities may be expected: (1) The primitive rocks which can magnetized uniformly rise in the region of disturbance to a shallow depth under surface of the earth, and (2) in case of a uniform horizontal situation of the rystalline subsoil the different materials inside of them cause the magnetic sturbance.

This anomaly can also be produced by both possibilities at the same time. two cases are examined theoretically and the conclusion is drawn that the rth-magnetic disturbance can, in general, be explained by both of them; that is, veral solutions are possible.

To reduce the ambiguity of the solutions the author recommends that the gnetic proceeding used for the establishment of the substructure be completed by her geophysical methods of prospecting such as seismic and gravimetrical, that is, e pendulum and torsion balance measurements.

After a brief discussion of these methods he concludes that to confine the biguity of the explanation of the reasons of the Danzig magnetic disturbance to oser limits the best success can be obtained by the torsion balance measurements. V. Ayvazoglou.

MAGNETISCHE VERMESSUNG EINIGER TERTIÄRER ERUPTIVGÄNGE UND-STÖCKE IM SÄCHSICHEN ELBSANDSTEINGEBIRGE

(MAGNETIC MEASUREMENTS OF SOME TERTIARY ERUPTION LODES AND ERUPTION STOCKS ON SAXONIAN ELBSANDSTEIN-MOUNTAINS)

By E. G. Schulze

Zeitschrift fuer Geophysik, vol. 6,, No. 3, 1930, pp. 141-156.

This field work was carried out from July 23 to September 30, 1927.

1. The instrument. Schmidt's vertical field balance, manufactured by the kania-Werke was used. The balance was improved by placing two thermometers in e interior part of the balance and the box was provided with a protecting cap ned with cork to prevent too quick a temperature equalization. The instrument oved to be very useful.

2. Measurements. Owing to three favorable conditions (stations very close one another, security of scale adjustment, and great variations in readings) ly about 4 minutes were required for each measurement so that 30 to 50 stations uld be made per day. In all, about 2,000 measurements were taken. Figures and ps added to the article give a good picture of the great variations of the dis- rbance values.

3. Places of investigation. (a) The Zeughaus lode - this deposit is worthy of notice as notwithstanding its great extent it shows a remarkable regularity; (b) deposits near the Klein Pohlshorn; and (c) deposits near Darnsteinweg.

In conclusion the author says that it has been established that the magnetic pole-axis of the rock bodies of all of the investigated basalt deposit does not agree with the position of the earth's field, its direction being in m cases even opposite to it. Therefore, the disturbances can not be explained on by the induction effect of the earth's field and an assumption of the existence a very regularly developed rock magnetism can be made, the position of the axis which is in contradiction to the present direction of the induction. Exception great disturbances are explained by the effects of lightning. Magnetic measure ments of the eruption rock bodies in the other places of the vast chalk region desirable.--W. Ayvazoglou.

ÜBER DIE EXISTENZ EINER MONDENTÄGIGEN VARIATION IN DEN ERDSTRÖMEN

(ON THE EXISTENCE OF LUNAR DAY VARIATIONS IN THE EARTH CURRENTS)

By J. Egedal

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 157-158.

In this article Egedal tries to prove the existence of lunar day variat in the earth currents (horizontal electric potential gradients). He shows that earth current (north-south), measured by the Ebro-Observatory in Spain, is infl enced by the moon. The variation is remarkably wide and agrees in phase with t derivation of the function of the tide-equilibrium of the half day wave. A dia showing the influence of the moon upon the north-east earth current, as observe the Ebro-Observatory, is given.--W. Ayvazoglou.

MAGNETIC SURVEY IN NEFTE-CHALA IN 1929 (IN RUSSIAN)

By A. I. Zaborovsky

The Petroleum Industry (Moscow), vol. 13, No. 4, 1930, pp. 551-554.

This survey is a continuation of the geophysical investigation of the Chala region started in 1928 (See Geophysical Abstracts VIII, December, 1929). purpose of the survey was to prepare a general magnetic map of the region.

Two instruments for the measurement of the vertical component (Schmidt' balance) and two for the measurement of the horizontal component were used. Observations were made along 19 lines. Curves showing the distribution of the components are given in two figures. Geomagnetic maps are drawn based on the o servations.

Zoborovsky compares the results of observations with those obtained in 1928 nd mentions the following details:

1. The zone of anomaly becomes larger towards the northwest.

2. The maximum values of the vertical and horizontal components of the agnetic field decrease by advancing northwest.

3. In the center of the zone of anomaly single points appear with inimum values of the vertical force, surrounded by high values of this component.

4. A slight change in the direction of the extent of the zone towards the ast was observed.

Analyzing these particularities of anomaly, Zaborovsky draws the following onclusions:

1. The anticlinal fold rises towards the northwest. The laboratory nalysis of the magnetic properties of the rocks forming the deposits shows that he magnetic anomaly is caused by the magnetic mineral concentrated mainly near bsheron, and that the deeper strata contain only a small amount of magnetite. his fact explains the structure of the anticline obtained by the survey.

2. The thickness of deposits situated over the primitive rocks increases wards the northwest, which explains the decrease of the maximum deviations of the mponents of the magnetic field in this direction from the normal values.

3. The central line of the anticline changes its direction, deviating to- ards the east near the Kichikbyuk-byul hill.

4. From this point on the anticline begins to move downward again, as nown by the decrease of the width of the anomalous strip in this region.—W. yvazoglou.

3. SEISMIC METHODS

THE DISPERSION OF SEISMIC WAVES OF THE LOVE TYPE AND THE THICKNESS OF THE SURFACE LAYER OF THE EARTH UNDER THE PACIFIC

By Perry Byerly

Gerlands Beiträge zur Geophysik, vol. 36, No. 1, 1930, pp. 27-33.

Observations made at the Berkeley seismographic station for 11 years have een studied and data for the dispersion of the first wave of the Love type under he Pacific obtained. If these observations are correlated with wave velocity, they oint to a thickness of about 40 kilometers of the surface layer of the earth under he Pacific. If they are correlated with group velocity they point to a thickness f about 20 kilometers. The former correlation is probably the better.—Author's bstract.

4. ELECTRICAL METHODS

UEBER GEOELEKTRISCHE METHODEN MIT DIRECTER STROMZULEITUNG

(ON THE GEOELECTRIC METHODS WITH STATIONARY ELECTRIC CURRENT)

By J. Koenigsberger

Erganzungs-Hefte fuer angewandte Geophysik, vol. 1, No. 1, 1930, pp. 23-109.

The article is summarized by the author as follows:

"The magnetic field of a dipol of a stationary electric current sent int the earth was calculated and this theoretical field was compared with the observ field of an alternating current of 400 to 500 H frequency. The difference is du to the skin effect which can be divided into two separate effects: The first is due to the effect of the current which is flowing through the wire between the t earth electrodes on the current lines in the earth. The second is due to the mutual induction of the current lines in the earth. The first can be observed n the dipolaxis, the second at a greater distance from the wire on the prolongatio of the axis. Theoretically, the conclusion can be drawn that a general enlargem of the dimensions with an unchanged frequency is equal to a higher frequency wit original dimensions. Therefore, a greater length of the dipol axis (the distanc 2a between the earth electrodes E_1 E_2) always gives greater skin effects. This proved by experiments. A better conducting soil also gives a greater skin effec than a poorer conducting one."

The author prefers the use of low frequencies of 75 to 450 H to the use of high frequencies of 500 to 1,000 H or more. With low frequencies the change of phase is small, except where ore bodies are concealed in the underground. Hi frequency complicates the problem. Furthermore, high frequency current does not penetrate deeply enough into the earth.

The change of resistance in parallel, horizontal, infinite layers was de duced by two methods. For a better conductor at a depth, the ratio of two potential differences was calculated and measured on the prolongation of the dip axis at three points, A, B, C, each distant from the other by "a" ($2a = E_1 E_2$).

For layers having a lower conductivity than normal, another method to measure the ratio of the three intensities of the magnetic field in A, B, and C more exact. The depth of the upper surface of such a layer can be deduced from the value of "a" for which the ratio is a maximum. The Elbof method was used to determine bodies with two or three dimensions having the same average value as t depth. Some hints and calculations are given for finding the depth of a more or less conducting body from the deviations of the observed field lines in comparis with the normal field direction.

Insulators, such as oil and gas bearing strata and deposits and their upper gration zone, also cause deviations of the field lines.

A stretch of boggy land or a shallow lake on the earth's surface disturbs ie horizontal field little, but the vertical field component is much affected by allow inhomogeneities.

Topography and geological structure exercise strong effects. For detecting es and for distinguishing ores from other bodies which are better conductors than dinary soil but not as good as some ores, it is necessary to observe the phase lations directly or indirectly."

The contents of the article are as follows:

1. Introduction.

2. Theoretical normal picture of the current lines of the dipol in an ifinite semispace, as well as of its magnetic field for a direct current.

3. Experimental arrangement for the determination of the field.

4. Experimental error limits of measurements of equipotential lines by ans of probes and of magnetic dipol fields by means of induction coils.

5. Influence of an alternating current (skin effect, etc.) upon the rrent lines and the magnetic field.

6. The empirical normal picture of an alternating current (400 to 500 H), f the infinite semispace consisting essentially of two parts and the influence of ie skin effect.

7. Theoretical calculations of the potential difference quotient, Q, of ie electric field on the surface of the earth in case of an inhomogeneously ratified soil (deposits of a very great extent).

8. Determination of the potential difference quotient, Q.

9. Comparison of the intensities with the forms of the magnetic field on ie surface in case of a stratified soil (deposits of a very great extent).

10. Theoretical calculations of the effect of deposits of a smaller extent, pheres and oblate ellipsoids of rotation, upon electric and magnetic field on the rface of the earth.

11. Conclusions for evaluation if geoelectric deflection methods are used; etermination of depths of deposits of a not very great extent.

12. Effect of deposits the conductivity of which is not as good as that f the surrounding bodies.

13. Surface disturbances.

14. Effect of geological tectonic and of geological relief.

15. Ores.

16. Angles of tilt.

Thirty three figures illustrate the article.--W. Ayvazoglou.

ZUR MESSUNG DER ELEKTRISCHEN LEITFÄHIGKEIT DER ERDE DURCH INDUKTION

(ON THE MEASUREMENT OF THE ELECTRIC CONDUCTIVITY OF THE EARTH BY INDUCTION)

By J. Koenigsberger

Physikalische Zeitschrift, vol. 31. No. , 1930, pp. 487-498.

A calculation of the vertical component of the magnetic field intensity produced by induced currents is given. These currents are induced in an infinit conducting semispace by means of a circular current of a fixed radius passing through a very fine wire placed on the boundary surface of the semispace. Error caused by neglecting the skin effect, small phase displacements, and screening a estimated. The half empirical formula derived for the magnetic field of a curre in a level wire circle is discussed and examined by observations. Only the firs part of this formula is used for the integrations; the errors resulting from thi method are estimated. The theory is applied to the earth which is considered a semispace; the observations resulted in a resistance (3.10^4 ohms per cubic centi meter) of the upper layers of the earth of an order that could be expected. To penetrate to depths of over 1 and up to 20 kilometers, frequencies of less than 500 H are required; experimental sources of errors and difficulties are briefly discussed.--Author's abstract translated by W. Ayvazoglou.

LOCATING DEEPLY BURIED BED ROCK

By Irving R. Crosby

Engineering and Contracting, vol. 68, No. 10, 1929, pp. 429-430.

Locating bed rock, learning the nature of the overburden, and studying th character of the rock to determine whether it is suitable to serve as the founda tion of a large structure is of great importance. In working out these problems thorough understanding of the geology of the adjacent country is necessary. The author points out that in at least one of these problems, that is, the locating bed rock where it is deeply buried, electrical prospecting can be a valuable too for the geologist. Different types of geophysical prospecting were investigated while studying the geology at the Fifteen Mile Falls development of the New Engl Power Association, on the Connecticut River, with the result that the surface

tential electrical method, as applied by the Schlumberger methods, was chosen. e reasons for the rejection of the other methods of geophysical prospecting ravitational, seismic, magnetic, self-potential, and inductive) are briefly ntioned, and the application of the surface potential method which has been osen is described.

The results were checked with drill records which showed that they could depended upon as being within 10 per cent of the correct amount. These results re for depths of 27 to 142 feet, the deeper determinations being more correct.

In discussing the question of electrical prospecting for preliminary udies Crosby states that electrical prospecting can be of use to engineers when me and expense prohibit extensive drilling. It may ever be the only possible ans of locating bed rock. The author has found in actual practice that the best sults can be obtained when the geologist combines the drill information with that tained by electrical prospecting and studies them as a whole.

In the last paragraph of the article Crosby describes the application of e electrical method on the Connecticut River development. In conclusion he says: lectrical prospecting is a new and valuable tool for the engineering geologist, i it will help him to solve quickly the problems which the engineer may bring to n."--W. Ayvazoglou.

6. GEOTHERMAL METHODS

DETERMINATION OF GEOTHERMAL GRADIENTS IN OKLAHOMA

By John A. McCutchin

lletin of the American Association of Petroleum Geologists, vol. 14, No. 5, 1930, . 535-555.

This paper deals with the data of geothermal gradients collected from mperature surveys carried on since June, 1928, in approximately 150 wells located 24 separated fields in Oklahoma and Kansas. The purpose of this investigation to determine the possibility of using the temperature data for the location of l pools.

Description of methods and apparatus. The Van Orstrand method has been osely followed in the collection of data. A brief description of the method is ven.

Wells suitable for temperature tests. As a rule, the wells that have been illed with rotary tools are the most unsatisfactory wells in which to make mperature observations because the circulation of the rotary mud in the wells so sturbs the temperature distribution in the formations surrounding the hole that e hole must remain idle for a considerable time (about 30 days) before reliable mperature data can be obtained.

Temperature tests can be made in wells drilled with standard tools at a time the tools are out of the well. Temperature observations should not be made near the bottom of drilling wells as the action of the drill may produce an abnormally high temperature at this point.

Depth-temperature curves. A figure of a depth-temperature curve taken from a deep well in the Tonkawa field is shown. Depth-temperature curves re presenting wells in temperature equilibrium may, for all practical purposes, be considered as straight lines. However, when a close examination is made the curves are seen to be slightly curved at the shallower depths, the curvature increasing with increasing depth.

Shallow temperatures. The most important temperature data in a well are to be obtained from the first 1,000 feet. As the shallow temperatures act as a guide to the reliability of the data from the entire well, they should be given careful consideration by those endeavoring to correlate temperature data from well to well or area to area.

Explanation of cross sections. Variation in depth to the 80, 90, and 10 F. isothermal surfaces for several places are shown in two figures. The gradient ranges from 1° in 107.0 feet for the wells located near Oklahoma City to 1° in 36.5 and 40.0 feet for the wells located near Tulsa and Okemah. Several possibilities as to the reason for this difference are suggested.

An explanation of the table showing the variations in the gradient computed in terms of feet per degree F. for the fields where tests have been made is given.

An explanation is also given of several figures on which are drawn contours on 80° F. isothermal surface for wells of the Garber field, contours on 100° F. isothermal surface for a portion of the Cromwell field, gradient depth 100° F. for three wells located on the Haverhill, and contours for 100° F. isothermal surface for wells in the Eldorado, Kansas, field.

Variations in Oklahoma and Kansas fields. Temperature observations have been made in 24 fields in Oklahoma and Kansas. Because the only wells available for testing happened to be temporarily abandoned when the fields were visited, the data from most of these fields are too meager for conclusions to be drawn regarding the variation of temperature with geologic structures. However, it is interesting to note that in only two or perhaps three fields the data collected tended to disagree with the findings of Van Orstrand's previous work in Wyoming and California (Some Evidence on the Variation of Temperature with Geologic Structure in Wyoming and California fields. Economic Geology, vol. 21, No. 2, 1926).

Other uses for temperature data. New and important uses for the accurate temperature data that are being collected in Oklahoma are mentioned.

Conclusions. As a whole, the results obtained in Oklahoma to date on the nperature problem are neither consistent nor inconsistent enough to justify any ioral conclusions. The results indicate, however, that the problem is not simple l that it will probably be solved by the collection of additional accurate data the fields and in nonproductive areas, supplemented, perhaps, by some careful rk on the heat-conducting properties of sedimentary rocks in a well equipped oratory.—W. Ayvazoglou.

7. UNCLASSIFIED METHODS

GEOPHYSICAL PROSPECTING IN AUSTRALIA

Editorial note

Industrial Australian and Mining Standard, vol. 83, No. 2140, 1930, p. 312.

In the third annual report of the Council for Scientific and Industrial search reference is made to the geophysical prospecting campaign which has been oceeding in Australia for the past 18 months. It is stated that a mass of luable data has been obtained.

The gravimetric section completed its work in the Gelliondale district, ctoria, where it investigated the underground delineation of a bed of brown coal. e deductions drawn from the measured variations of gravity agreed to a reasonable gree of accuracy with the information obtained from bores.

Field investigations of the electrical section have been concluded in the llowing localities: Anembo and Captain's Flat, near Lake George, New South Wales; adville, New South Wales; Woods Point, Victoria; and several areas in the Zeehan l Renison districts of Tasmania.

Indications have been obtained of the existence of ore bodies. Arrange- nts are now being made for these indications to be tested by bores. In addition the search for ore bodies attention has been given to the application of the sh-Rooney method to the search of underground water. This work was carried out in e Victorian Mallee, but the results obtained have been somewhat inconclusive.

The seismic section was established and field work commenced at Gulgong, w South Wales, early in 1929. The section mainly confined its attention to paratus developed by Major E. H. Booth and the late Prof. Pollack of Sydney iversity and to Askania seismometer equipment.—W. Ayvazoglou.

GEOPHYSICS - NEWEST SCIENTIFIC AID IN THE SEARCH FOR PETROLEUM

By Bruce Bryan

Oil Bulletin, vol. 16, No. 2, 1930, pp. 132-134 and 200.

In this article Bryan discusses the applicability of geophysical methods of specting in California which, so far, have not been very successful in this ate.

He examines the following four methods: Seismic, magnetic, electrical, and gravimetric.

After a brief description of the principles of the seismic method, the author concludes that the complex nature of the structures and geology in Calif makes the use of this method difficult. The more or less populated regions in State also make the use of artificial earthquakes dangerous.

The magnetic method, which has been used chiefly in mineral prospecting and in a little work accomplished for oil searching, may become useful for loca ing oil structures in the future.

The actual commercial value of electrical methods for oil prospecting, particularly in California, has not been thoroughly demonstrated, but the autho of the opinion that a useful technique will ultimately be developed. Three cla of electrical methods, the self-potential, the surface potential, and the induc method, are briefly described.

The torsion balance, invented by Baron Eötvös, is the fourth method men tioned by Bryan of those in use for geophysical exploring of oil fields in Amer A description of the balance and its application is given.

In conclusion the author says that a department of geophysical research and exploration is certainly on the verge of being added to the list of special departments and scientific branches of the petroleum industry.--W. Ayvazoglou.

THE CARNEGIE'S SEVENTH CRUISE

By J. A. Fleming

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 5-13.

In this article Fleming summarizes the work done by the "Carnegie" duri its seventh cruise, previous to its total destruction as a result of an explosi that occurred on November 29, 1929, in the harbor of Apia, western Samoa.

Among the reports, compilations, and discussions planned and already be is a narrative account of the cruise, magnetic data and resulting compilations secular variations, the physical oceanography of the routes traversed, sonic-de results, earth-inductor measurements at sea of magnetic inclination and horizon intensity, determination of salinity at sea, gravity observations, chemical and biological results, meteorological observations, radio work, atmospheric-electr results, and confirmation at sea that the principal 24-hour wave of the diurnal variation of the atmospheric potential gradient is according to universal time.

A map of the cruise (from May 1, 1928, to November 29, 1929) showing lo tions of oceanographical series stations and two tables in which the magnetic w done and the results of chemical, physical, biological, sonic-depth, and bottom sample data are visualized are added to the article.--W. Ayvazoglou.

REPORT ON THE ACTIVITY OF THE EARTHQUAKE RESEARCH INSTITUTE, TOKYO IMPERIAL UNIVERSITY, IN THE LATTER HALF OF 1929

By Chuji Tsuboi

Gerlands Beitrage zur Geophysik, vol. 26, No. 1, 1930, pp. 111-122.

The first report on the activity of the Earthquake Research Institute was lished in Gerlands Beitrage, vol. 23, No. 4, 1929, pp. 430-441 (see Geophysical tracts No. X), in the Institute.

In this report Tsuboi gives a short summary of the work of he Institute er the following headings:

1. Investigations on the deformation of the earth's crust in the Tango trict connected with the Tango earthquake of 1927. A map showing the displace- t of the secondary triangulation points in the Tango district is added.

2. Eruption of Mount Komagatake. Microseismographs, Ishimoto's tiltometer, Tsuboi's gravity variometer were used for detecting shocks and changes in the vitational field in the neighborhood of the volcano. A figure showing lines of al depression around the volcano prepared by Tsuboi based on a survey carried by the Land Survey Department is given.

Interesting electric phenomena were observed. A cluster of tremendous htning flashes is reproduced in a photographic picture.

3. Geophysical investigations. (1) T. Terada proposed a mechanical theory the form of volcanoes; (2) C. Tsuboi ascertained a remarkable relation between geographical distributions of the gravitational anomalies and of the positions the epicenters of earthquake in Japan (illustrated by figures). He continued observation on the time variation of the second space derivatives of the gravi- ional potential; and (3) K. Suyehiro developed the observation with his seismic ration analyser.

4. Instrumental investigations. (1) M. Ishimoto and R. Takahashi designed constructed an accelerometer for directly recording the acceleration of any ion. This instrument is a kind of seismometer with a very short period and high nification. A brief description is given. (2) Attention is called to the ting of the ground as it may be a manifestation of the strain to which the und is subjected. Ishimoto's tiltometer has been used for these observations. allel with this, observations by means of a pair of water levels have also been rted. Iron tubes with a length of 18 meters, enameled inside, are installed in unnel. They are filled with water and serve as instruments to measure the tilt- of the ground. R. Takahashi is making continuous observations, the results of ch may be useful for studying the nature of minute tilting of the ground.

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5. Seismometrical investigations. (1) A. Imamura, F. Kishinouye, and T. Kodaira discussed the effect of superficial sedimentary layers upon the trans mission of seismic waves and (2) A. Imamura examined the vibration of the ground itself, which is induced at the arrival of seismic waves.

6. Mathematical investigations. K. Sezawa studied harmonic Rayleigh wa produced in a dispersive medium by a single impulse applied on its surface. He also pointed out from the results of a mathematical analysis (made in cooperati with G. Nishimura) the existence of a displacement independent of "dilation" and "rotation" in a solid body. Sezawa studied also the generation of Rayleigh wave from a sheet of internal source and the propagation of Love waves on a spherical surface.

7. Geological investigations. (1) H. Tsuya made an exhaustive geologi and petrographical study of the volcano Kodzushima, and (2) F. Tada introduced new method of tracing the crustal movement that a river bed might have suffered.

Detailed accounts of the works mentioned in this paper have already bee or will shortly be published in the bulletin of the Earthquake Research Institu W. Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN VOLUME 1, NOS. 6 AND 7, OF THE "BOLETIN DE LA ASOCIACION GEOFISICA DE MEXICO."

Boletin de la Asociation Geofisica de Mexico, vol. 1, Nos. 6 and 7, 1929 and 19 pp. 97-109 and 111-125.

1. Description of the improved "Oertling" type of the Eötvös' torsion balance.

2. Physical principles of the gravimetric method of prospecting, by P Nikiforov. This is the continuation of the Russian article, translated into Spanish by Prof. Juan Korzujin (see Geophys. Abs. 13 and 14).

3. Results of gravity observations of 1928 near Lake Baskunchak, by B. Numerov. This is a reprint of the article published in the "Zeitschrift fu Geophysik," vol. 5, No. 7, 1929, of which an abstract was given in Geophys. Ab 10, February, 1930.

4. Geophysical methods of prospecting (Los metodes geofisicos de expl cion), by Georges-Albert Boutry. The article appeared in "La Révue Petrolifie No. 325, 1929, pp. 821-825. A translation into Spanish made by L. Urguijo, En is given in the "Boletin," vol. 1, No. 7, 1930, pp. 119-125. The translation to be continued. An abstract of Boutry's article was published in Geophys. Ab December, 1929.--W. Ayvazoglou.

SUR L'APPLICATION DES METHODES GEOPHYSIQUES A LA PROSPECTION DU SOUS-SOL EN ROUMANIE

(APPLICATION OF GEOPHYSICAL METHODS FOR PROSPECTING THE SUBSOIL IN ROUMANIA)

By T. P. Ghitulescu

Annales des Mines de Roumanie, vol. 13, No. 1, 1930, pp. 7-15.

Taking into consideration the importance of geophysical methods of pros-ting and hence the necessity of collaboration of all interested in this science, tulescu gives some results obtained from the work in this field in Roumania.

After a brief historical review of geophysical work in Roumania, the hor sets forth the results of study of some typical problems. Results obtained different methods of geophysical prospecting for the same regions are discussed, cases in which the geophysical work was proved by drilling are mentioned.

Region of Altan Tepe. Magnetic and electrical methods of prospecting were d. The results of both methods are shown in an accompanying map. The results measurements obtained by Schmidt's variometer are represented on the map by gums (from 100 to 100 gamma). Magnetic perturbations reached values of 1,000 ma. The interpretation of the measurements resulted in the discovery of a small s (shown in the map). Moreover, some other geological conclusions could be wn.

The results of electrical prospecting are shown in the same map. This hod proved the existence of the small lens, as well as the zone of impregnation covered by the magnetic method.

Region of Aricesti; study of an anticlinal dome. The region is situated r Ploesti. Electrical prospecting (Schlumberger's method) indicated the anti-nal fold, the line of axis of which agreed with that discovered by direct explo-ion. A map is added. No interesting indications were obtained by the magnetic hod of prospecting.

Region of Calinesti-Floresti-Baicoi. From the geological viewpoint this ion is characterized by anticlinal folds of Pliocene and Miocene strata with t domes distributed in all formations almost up to the surface which, in general, sists of alluvial deposits. The position of the Floresti salt dome was not well wn, but more than 25 wells from 20 to 80 meters in depth and seven borings of m 600 to 1,200 meters were made. Only one part of the southern border of the e could be established. Three different geophysical methods of prospecting were ed in this region: Magnetic, electrical, and gravimetric. The results are en in two maps.

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Region of Moreni. This is the most important petroliferous region of Roumania. Direct prospection for petroleum was studied here. After describing the geological structure of this region the author gives the results of the electrical method of prospecting in the region. Two successful boring, shown in a map, were made from the data obtained. The author draws some general conclusi on the possibility of application of geophysical methods in Roumania:

1. Good results were obtained by magnetic methods when the difference magnetic permeabilities were great enough for producing magnetic perturbations a certain number of gammas. The application of the magnetic method to the dis-- covery of domes did not give conclusive results.

2. Gravimetric methods have given good results for studying the struct of the subsoil in topographically smooth regions and especially for studying sa domes.

3. Various applications of electrical methods were made. For prospect for metalliferous deposits the data obtained were in general concordant and som times very accurate. Some electrical methods for the study of the structure of the subsoil were very effective and were sufficiently sensitive for obtaining d tails. The results of a direct prospecting for oil are very encouraging.--W. Ayvazoglou.

LES METHODES DE PROSPECTION GEOPHYSIQUE. LA PROSPECTION DU PETROLE

(METHODS OF GEOPHYSICAL PROSPECTING. PROSPECTING FOR OIL)

By B. Sergescu

Annales des Mines de Roumanie, vol. 13, Nos. 1, 2, 1930, pp. 37-43 and 79-83

Gravitational, magnetic, and electrical methods of prospecting were dis cussed by the author in a series of articles published in Nos. 10, 11, and 12, 1929, of the same magazine (see Geophys. Abs. 10). The present articles deal w seismic, radioactive, and geothermal methods.

Seismic methods. Fundamental principles of the method and the construc of the instruments are described. Two types (mechanical and electrical registr tion) are examined and compared. Velocities of propagation for sandstone (1,80 meters per second), salt (4,800 meters per second), calc-spar (5,000 meters per second), and sediments (about 3,600 meters per second) are given. As an exampl of the application of the seismic method of prospection the profile obtained by W. Schweydar in Sperenberg is given. In conclusion the author calculates the price of a complete equipment (without radio installation) necessary for seismi exploration, which according to his figures is 400,000 to 500,000 lei.

Radioactive methods. -The process of measuring the radioactivity is ex-
ained by an example given in a figure.

Geothermal measurements. The reasons for the variation of the temperature,
e theoretically calculated value of which increases about 1° C. for each 32
ters of depth if measured towards the center of the earth, are discussed.
rgescu summarizes the local conditions on which these variations depend, as
llows: (1) Intense temperature of surrounding rocks which may cause a diminution
the geothermal degree; (2) layers containing radioactive substances which reduce
e geothermal degree by freeing their heat; (3) changes of temperature due to
nning cold or hot water, gas, etc.; (4) chemical reactions by which heat is dis-
gaged; (5) heat caused by friction of layers; and (6) the conductibility of heat
rocks which influences the distribution of the temperature inside of the earth.

The thermometers used for measuring temperatures inside of the earth are
scribed.--W. Ayvazoglou.

DIE DYNAMISCHE VERGRÖSSERUNG VON SCHALLREGISTRIERINSTRUMENTEN FUER ANDAUERNDE SINUSWELLEN

(THE DYNAMIC AMPLIFICATION OF SOUND-REGISTERING INSTRUMENTS FOR CONTINUOUS SINE WAVES)

By B. Gutenberg

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 34-36.

The usual sound-registering instruments record continuous sine waves of
ual phase differences in the same way that the seismometers record the earthquake
ves. The ratio of amplification of a wave of period T to the amplification of
ry long waves can be derived from the curves for the corresponding ratio for a
ismometer with the amplification for very short waves by substituting the
piprocal value for $T : T_o$ (T_o = self-period).--Aurthor's abstract translated by
Ayvazoglou.

GEOPHYSICAL PROSPECTING AND THE PROSPECTOR

Editorial note

Canadian Mining Journal, vol. 51, No. 18, 1930, p. 408.

The author of the note expresses the opinion that although geophysical
thods of prospecting have become recognized as additional tools of the mining
dustry they have superceded nothing and that in the discovery of mineral deposits
e prospector is just as essential as he ever was. His quest is the first step
the long and orderly march of events that finally culminates in a producing mine
, being the first, is one of the most important steps.--W. Ayvazoglou.

8. GEOLOGY

DIE KONTINENTALEN VERSCHIEBUNGEN VON AMERIKA UND MADAGASKAR

(THE CONTINENTAL DISPLACEMENTS OF AMERICA AND MADAGASCAR)

By R. Livländer

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 134-140.

Livländer tries to derive some facts on the "Displacement of America" d on a great number of accurate observation data of the longitudinal difference o Europe and North America. According to the theory this displacement amounts to about one meter per year.

From the investigations discussed in this article the author draws the clusion that the displacement of America, if there is any, is considerably smal than 1 meter per year and may amount to a few centimeters only.

The displacement of Madagascar also remains unproved because the longitudinal data of Madagascar are so far not fitted for any conclusion on thi question. The only two measurements of latitude available do not show any dis- placement.—W. Ayvazoglou.

9. NEW BOOKS

anck, Prof. Dr. E. Handbuch der Bodenlehre (Handbook of the study of the soil). Vol. VI; Die Physikalische Beschaffenheit des Bodens (Physical conditions of the soil). 1930, 104 figures, 423 pages. Price: Rm. 43.60; bound, Rm. 46.00. Verlag von Julius Springer, Berlin. Contents: The soil as a substratum; mechanical composition of the soil and phenomena depending on it; mechanical structure of the soil (by Prof. Dr. A. Densch, Landsberg); behavior of the soil with regard to water (by Prof. Dr. F. Zunker); evaporation of water from the soil (by Prof. Dr. M. Helbig); behavior of the soil with regard to air (by Dr. F. Giesecke); behavior of the soil with regard to heat (by Prof. Dr. J. Schubert); and behavior of the soil with regard to electricity and radio-activity of the soil (by Prof. Dr. V. F. Hess). The whole edition will consist of 10 volumes. In addition to volume VI mentioned above, the following volumes are issued so far: Vol. I, Naturwissenschaftliche Grundlagen, 1929, Rm. 27, bound Rm. 29.60; vol. II, Verwitterungslehre, 1929, Rm. 29.60, bound Rm. 32.00; vol. III, Verteilung der Bodenarten, 1929, Rm. 54.00, bound Rm. 57.00.

azard, Daniel L. Directions for magnetic measurements. U. S. Department of Commerce, Coast and Geodetic Survey, serial No. 166; 129 pages, 14 figures and 13 tables. Government Printing Office, price 30 cents. Contents: Introduction; bibliography; theory of magnetic measurements - properties of magnets, the earth's magnetism, derivation of formulas, determination of the constants of a magnetometer; and directions for magnetic observations on land - general directions, equipment, latitude from observations of the sun, latitude from observations of Polaris, determination of the true meridian and local mean time by observations of the sun, determination of the true meridian by observations of Polaris, determination of the true meridian by observations of the sun at apparent noon, latitude and azimuth from star observations, determination of the magnetic declination, determination of the dip, determination of the horizontal intensity, determination of the total intensity, investigation of regions of local disturbance, directions for observations at sea, operation of a magnetic observatory, and earthquakes.

bthe, E. Les Méthodes de Prospection du sous-sol. (Methods of subsoil prospection) 392 pages, 156 figures. Price 75 francs; Gauthier-Villars, quai des Grands-Augustins, Paris. Contents: Part I.- Magnetic method. Chapter I, Methods and instruments. A. Absolute methods. (1) Measurement of declination; (2) measurement of inclination; and (3) measurement of the horizontal component H. B. Relative methods. (1) Variations at one point; (2) variation from one point to another; and (3) universal variometer (Haalck), manipulation. Chapter II, Application of magnetic method. Chapter III, Interpretation of the results. Part II.- Electrical method. Chapter IV, Methods and instruments, manipulation. Chapter V, Application of the electrical method. Part III.- Seismic method. Chapter VI, Methods and instruments, manipulation. Chaper VII, Experience and interpretation. Part IV.- Gravitational methods. Chapter VIII, Potential and its derivatives, their use. Chapter IX, Apparatus. Chapter X, Topographic corrections, Chapter XI, Interpretation and examples.

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GEOPHYSICAL ABSTRACTS[1]

No. 17.

Compiled by Frederick W. Lee[2]

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[1] - The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6366."

[2] - Senior physicist, U. S. Bureau of Mines.

1. GRAVITATIONAL METHODS

INTERPRETATION OF GRAVITATIONAL ANOMALIES

By H. Shaw

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 338, 1930, 33 pp.

This article is the continuation of the author's previous paper (Technical Publication No. 178; see Geophysical Abstracts No. 5) in which he analyzed the gravitational effects arising from certain subterranean anomalies of simple form, and extending to infinity in three directions.

In this article, which may serve as a preliminary work to further analyses of more complex structures, certain factors are examined which characterize (1) the simple infinite vertical block and (2) an infinite block which is inclined to the vertical—formations which are of considerable practical interest, as they are typical of important geological structures.

As in the earlier work, consideration of these factors is limited almost entirely to an analysis of the features and characteristics of the gradient and differential curvature.

Part I. Infinite vertical block.—The case of a vertical block rising from an infinite depth and also extending to infinity in the two directions +y and -y is considered:

(a) Gradient characteristics: Variation of maximum gradient with depth; position of the maximum gradient; variation of gradient with distance from midpoint; gradient value at definite distance from center line; inclination of the gradient curve at the origin; gradient interpretation.

(b) Characteristics of differential curvature: Variation of maximum curvature with depth; position of maximum curvature; variation of curvature with distance from center line; positions at which curvature attains definite values; curvature interpretation.

(c) Comparison of gradient and curvature effects: Intersection of gradient and curvature values; combined gradient and curvature interpretation; geometrical construction; comparison of horizontal and vertical infinite blocks.

Part II. Infinite inclined block.—The case of an inclined dike or lode is examined, and the characteristics of the gravitational effects resulting from such an anomaly are compared with those of the vertical block.

(a) Gradient characteristics: Value of maximum gradient; position of maximum gradient; gradient over midpoint of block; position of zero gradient; comparison of the first and second maximum gradients; gradient interpretation.

(b) Characteristic of differential curvature: Determination of curvature value; variation of maximum curvature with depth; curvature over midpoint of

ock; differential curvature interpretation; comparison of gradient and curva-
re effects.

(c) Combined gradient and curvature interpolation.

The article is illustrated by 30 diagrams.--W. Ayvazoglou.

EINE NEUE KONSTRUKTION DER EÖTVÖSSCHEN DREHWAGE

(A NEW CONSTRUCTION OF EÖTVÖS' TORSION BALANCE)

By Stefan Rybar

Mathematisch-Naturwissenschaftlicher Anzeiger, Budapest,
No. 46, 1926, pp. 698-723.

In the first part of the article the author examines the fundamental
rinciples, established in 1924, by the application of which a considerable re-
uction in the size of the Eötvös torsion balance could be obtained without
essening the sensitivity of the instrument. In the second part Rybar discusses
he investigations concerning the elimination of the disturbing influences ap-
earing in the torsion balance, and in the last part a description of the mechan-
al construction of the torsion balance is given.--Abstract translated from the
aysikalische Berichte, vol. 11, No. 7, 1930.

THE BIFILAR PENDULUM

By Paul E. Klopsteg

The Review of Scientific Instruments, vol. 1, No. 1, 1930, pp. 3-8.

The author states that in reviewing the literature on the bifilar
endulum he was convinced that the bifilar pendulum was worthy of study to de-
ermine its merits as educational apparatus.

In connection with a figure Klopsteg discusses briefly the ideal
ifilar pendulum and its construction. Two figures show some details of the
onstruction. Special arrangements for adjusting the lengths of the filaments
re described.--W. Ayvazoglou.

GRAVITATIONAL METHOD OF PROSPECTING (IN SERBIAN)

By D. V. Frost

idarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry),
Belgrade, vol. 2, No. 4, 1930, pp. 172-178.

This is a continuation of a brief mathematical theory of the gravita-
ional method and its application in practice. (See Geophysical Abstracts No.
2, p. 3).--V. Gorsky.

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PROBLEMS OF GRAVIMETRICAL INVESTIGATIONS IN THE REGION OF NIJNE-TAGILSK IN THE URALS (IN RUSSIAN)

By A. N. Zavaritsky

Gorny Journal (Mining Journal), Moscow, 1924, Nos. 9-10.

Platinum deposits of the Urals are closely connected with the dunite massives surrounded by a strip of pyrexonite situated in the zone of gabbro. From the theoretical and practical viewpoint the question of the form of the gabbro-peridotite massif is important--that is, whether it is of batholith or laccolith form. In the first case almost improbable figures of the increase of the content of platinum with the depth of the massif can be expected. In the second case, concentration of platinum at the bottom of the laccolith--similar, for example, to the pyrrhotite deposits in Sudbury--must be expected if consideration is given to the hypothesis of settling of platinum owing to its higher specific gravity.

The author gives data of measurements of the force of gravity carried out by means of Sterneck's pendulum in 1900 and 1903 by the Kazan observatory. The high values of the positive anomalies determined in the region of the gabbro peridotite massif speak in favor of laccolith. But these measurements can not be considered sufficient for any conclusions, owing to their small number and distribution over a large area; thus the author proposes to carry out detailed and accurate measurements which will be important for making clear the structure of the area and will put on a practical basis the question of prospecting and mining of platinum deposits.--V. Gorsky.

PRIMARY PLATINUM DEPOSITS OF THE URALS (IN RUSSIAN)

By A. N. Zavaritsky

Comité Géologique de l'U.S.S.R. Máteriaux pour la géologie générale et appliquée No. 8, Leningrad, 1928, pp. 1-56.

The author describes the Ural primary deposits of platinum and gives an interesting theory of their origin. The intensive study of the platinum-bearing region by Russian scientists during the last years was accompanied also by gravimetric measurements in connection with the problem proposed by the author in one of his previous articles (see the article preceding). Zavaritsky communicates the results of the work carried out in 1924 by the Astronomic-Geodetical Institute (determination of the force of gravity according to observations on pendulum oscillations in Stuckratt's apparatus) and by the Institute of Practical Geophysics (determination of gradient of the force of gravity by means of Eötvös torsion balance).

The work of studying the structure of the eruptive complex carried out with the Eötvös torsion balance, although more complicated and accurate than that with the pendulum, did not add any essential results. The pendulum gives directly the necessary indications on the form of the deposit and the size of the gabbro-peridotite massif. Conclusions from the measurements were drawn by A.

jitsky (Bulletin of the Astronomical Institute No. 9, 1925). Along the border tween the sedimentary rocks of the western slope of the Urals and the eruptive mplex a sharp increase of positive anomalies of force of gravity is observed. is increase can best be explained by the fact that there exists, to the east the summit, a curve of force of gravity anomaly of more compact masses, the ecific gravity of which differs from that of the rock situated to the west at om 0.25 to 0.30. These heavy masses extend over more than 10 kilometers; on e western side they are limited by abruptly sloping ground. By assuming a eater difference in densities of the two series of rocks the course of the rve of the anomaly can not be explained satisfactorily.

From the last condition a conclusion can be drawn that the gravimetric vestigation indicates the presence of heavy gabbro masses or greenstone masses. e specific gravity of dunite is equal to 3.25; that is, is higher than the ecific gravity of sedimentary rocks at about 0.6. According to the conclu- ons drawn by Gijitsky based on gravimetric observations, the extension of nite to a considerable depth (10 km.) seems improbable. The difference in nsities (0.25 - 0.30) required for the explanations of the anomaly is two mes smaller than it would be in case of the existence of dunite; thus it must supposed that the size of the latter is limited. Gravimetrical investiga- ons do not solve the question of the depth of dunite, but on the other hand ey do not contradict the assumption of laccolite deposit of gabbroperidotite ssif with gabbro-batholithic root deposits. Therefore the hypothesis of the istence of a dunite massif preserving its structure at a great depth seems probable.--V. Gorsky.

NOMOGRAPHS FOR CALCULATING THE SECOND DERIVATIVES OF THE FORCE OF GRAVITY POTENTIAL OBTAINED BY OBSERVATIONS MADE WITH A TORSION BALANCE AT 5 AZIMUTHS

By A. Stepanoff

Department of Commerce, U. S. Bureau of Mines, Information Circular 6306, 1930, 7 pp.

On the basis of an example the author describes the process of con- ruction of nomographs by which the second derivatives of the force of gravity tential obtained by observations made with a torsion balance at 5 azimuths y be found directly.--W. Ayvazoglou.

2. MAGNETIC METHODS

MAGNETISCHE MESSUNGEN IN BERGGIESSHÜBEL

(MAGNETIC MEASUREMENTS IN BERGGIESSHÜBEL)

By H. Seblatnigg

Ergänzungshefte fuer Angewandte Geophysik, vol. 1, No. 1, 1930, pp. 110-116.

The region described in this paper has already been investigated by A. Heiland. Under the direction of Seblatnigg, magnetic measurements were

made in May, 1930, in the region to the east of Berggiesshübel. A map showing the geological structure of the region is given. Measurements of the vertical intensity were made by means of two local variometers manufactured by Askania-Werke. Sensitiveness of the instruments was about 60 γ per graduation of the scale. It was established that the limits of error did not exceed 30 γ. The position of the stations is shown in a figure. Isodynamics of the vertical intensity were drawn by interpolation from the results obtained at single stations. Highest positive values of vertical intensity could be expected at stations below which ore has been proved with certainty, but just the contrary was observed. The highest negative values (-1500 γ) were observed at the southwestern border of the region under investigation at the place where the Muttergottes deposit has been developed.

From the course of the isodynamics and from the form of several regions of disturbance a conclusion can be drawn that the upper limits of the deposits by which the disturbance is caused, lie at a depth not over 20 to 40 meters below the earth's surface. From the conformity of the position of the extreme negative values a conclusion can be drawn that magnetite is the real cause of these magnetic disturbances.

In conclusion the author says that the magnetite deposit of Berggiesshübel, as it seems, is the first case in which the direction of magnetization established with certainty on a large area, does not agree with the direction of the present magnetic earth field. Although the problem can not be solved definitely based on the results obtained these results may contribute to the question of local magnetic disturbances. The author expects to continue the investigations on a larger scale.--W. Ayvazoglou.

REPORT ON THE NIPPON SUIROBU MAGNETOMETER, JAPANESE HYDROGRAPHIC DEPARTMENT

Japanese Journal of Astronomy and Geophysics, vol. 7, No. 3, March, 1930.

I. Introduction. The Nippon Suirobu magnetometer is a portable instrument for measuring the three elements of terrestrial magnetism, designed with a view to simplicity and rapidity of operation.

II. Measurement of Magnetic Elements.

1. Declination. When the transverse axis of the Helmholtz-Gaugain coil is placed in a horizontal position and the coil is charged electrically, a small compass at its center assumes the position resulting from the superposition of the coil's field upon that of the earth.

2. Dip is measured by adjusting the axis of a rotating coil until no current is recorded on a sensitive galvanometer.

3. Horizontal intensity is measured by means of vector subtraction of the coil force from the resultant force of coil and earth.

III. The instrument consists of the following principal parts:

1. Combined theodolite and rotating coil.

2. Helmholtz-Gaugain coil and mirror magnetometer.

3. Electrical standard meter.

4. Electrical accessories:

   a. Rheostat box.

   b. Galvanometer of Broca type.

   c. Dry cells.

   d. Switches.

5. Standard coil.

Standardization of instrument.

1. The electrical constant of the standard coil was measured in the laboratory of the Central Bureau of Weights and Measures.

2. The electrical constant of the Helmholtz-Gaugain coil was determined with a potentiometer and standard resistances by Watanabe's method.

3. The temperature corrections were determined by the mechanical changes in the coils.

Instructions for the use of the instrument are given for observing:

1. Bearings of terrestrial marks.

2. Magnetic meridian.

3. Horizontal intensity.

4. Checking of terrestrial marks.

5. Dip.

Results of observations. Trial observations were made in March, 1929, at Kakoika Magnetic Observatory. The mean differences between the values observed with the observatory magnetograph and with the present instrument were: 0.8 in declination, 0.3 in dip, and 33 gamma in horizontal intensity.

For details of formulas, instructions, tables, and photographs, the original paper should be consulted.--Irwin Roman.

I.C. 6366

AUFSUCHEN VON VERGRABENER MUNITION DURCH MAGNETISCHE UND ELEKTRISCHE MESSUNGEN

(SEARCH FOR BURIED AMMUNITION BY MEANS OF MAGNETIC AND ELECTRIC MEASUREMENTS)

By A. Ebert

Ergänzungshefte für Angewandte Geophysik, vol. 1, No. 1, 1930, pp. 9-14.

In this article Ebert describes how geophysical methods of prospecti were used for the discovery of two stores of ammunition, buried during the war the place of which was not known. The amount, as well as the content of the stores, was unknown also.

For scientific reasons, both the magnetic and the electrical methods were used. Magnetic investigation was made by means of a vertical variometer, manufactured by Askania-Werke, with a sensitiveness of about 30 γ per scale division. Electrical measurements were made by using alternating current.

Geologically the region of investigation consisted of alluvial soil, gravel, and clay. In both cases the position of the stores was established.

Details of investigation are shown in a series of figures.--W. Ayvazoglou.

BEZIEHUNGEN ZWISCHEN ERDMAGNETISMUS UND KARBON IM OSNABRÜCKER LANDE

(RELATION BETWEEN THE EARTHMAGNETISM AND CARBON IN THE COUNTRY OF OSNABRÜCK)

By August Kaiser

Ergänzungshefte fuer Angewandte Geophysik, vol. 1, No. 1, 1930, pp. 15-22

Kaiser tries to give an evaluation of measurements of the magnetic vertical intensity (Z) accomplished in 1928 in the region of Osnabrück. A detailed description of measurements, including tables and maps, is to appear in a short time in the "Beiträge zur physikalischen Erforschung der Erdrinde" issued by the Preussische Geologische Landesanstalt, under the title: "Magnetische Messungen in Nordwestdeutschland". (Magnetic Measurements in Northwestern Germany).

The article is divided into three parts: (1) Introduction and instrumental-physical section; (2) geologic-physical section, and (3) summary.

In the latter part the author says: "Notwithstanding the fact that the hypothesis established by H. Reich, that a negative anomaly is shown above carbon, has not been proved in Piesberg, a confirmation of this hypothesis could be discovered in general. In discussing the relation between the hill-carbon and magnetic measurement the confirmation of the above-mentioned hypothesis can be derived. Whether the Piesberg carbon agree with this hypothesis could not established definitely. But it may be accepted that the positive effects of the crystalline subsoil cover the negative effects of the Piesberg-carbon.

The parallelism of results obtained by magnetic survey and gravity surement is to be mentioned. The rising crystalline elevations were indi-ed by gravity measurement, but the exact position and extension of this ele-ion was established by magnetic measurement. This shows again that the mag-ic method must be considered to be of good aid to geologists and mining engi-ers."

Two maps showing the magnetic Z-anomalies and the Bouger's gravity malies in the vicinity of Osnabrück are added.--W. Ayvazoglou.

THE SENSITIVITY OF THE DIP NEEDLE

By C. O. Swanson

Bulletin of the Michigan College of Mining and Technology. New Series, vol. 4, No. 1, 1930, pp. 248-258.

The particular subject treated in this paper is the variation in the sitivity of the dip needle with changes in the magnetic field. From a prac-al standpoint the investigation gives a method of adjusting the dip needle as to make it most sensitive for the particular field under observation, and lains certain peculiarities of the instrument which have led to erroneous erpretations of magnetic data in certain cases.

Contents of the article:

1. The dip needle and its operation. A brief description of the common Gurley dip needle is given.

2. Calculation of the dip reading. Graphical representations of the calculation.

3. Application of the principles. Shown by an example.

4. The effect of abnormally counterweighting the needle. A series of abnormalities described make an instrument unfit for use.

5. Conclusion. Magnetic information obtained with the dip needle has proved very useful as a guide in working out buried structures.--W. Ayvazoglou.

DISTRIBUTION DES ÉLÉMENTS DE MAGNETISME TERRESTRE DANS LE ROYAUME DES SERBES, CROATES ET SLOVÈNES

(DISTRIBUTION OF THE ELEMENTS OF THE TERRESTRIAL MAGNETISM IN THE KINGDOM OF THE SERBS, CROATS AND SLOVENES)

By J. Mokrović

Travaux de l'institut de physique de globe de Zagreb (Yugoslavia), 1928, pp. 1-32.

The author gives the results of all measurements of magnetic elements

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accomplished on the territory of the present Yugoslavia from 1806 to 1918 (Marieni, K. Kreil, G. Schenzl, J. Schellander, E. Gelcic, H. Hartl, F. Laschober, V. Kesslitz, S. Schluet, J. Liznar, Kurlander, R. Eötvös, D. Pekar, L. Steiner, E. Tekete, A. Kugler, A. Gavazzi, A. Nippoldt, Carnegie Institution A. Schedler).

Based on these data the author calculates, according to a special method, the values of D, H, and I for the epoch of 1927.5 for all the 218 stations of observation, which, of course, are distributed over the whole territory of Yugoslavia very irregularly, and draws maps of isogons, isoclines, and horizontal isodynamics. Owing to the fact that there are no new detailed magnetic measurements, these maps give a fairly good orientation in the distribution of magnetic elements.

Considerable local anomalies in the distribution of the magnetic elements which can be attributed to the geological structure of the territory (regions of crystalline slates and eruptive rocks) can be roughly determined.—V. Gorsky.

HORIZONTAL COMPONENT OF THE ANOMALOUS MAGNETIC FIELD IN KHORVATIA AND SLAVONIA (IN SERBIAN)

By J. Mokrović

Bulletin de l'institut de Zagreb (Yugoslavia), vol. III, 1929, pp. 98-105.

Based on the measurements made by A. Kugler in 1915-1916, reduced to 1927.5 the author works out the declination and horizontal tension of the magnetic field for 80 stations of observations in Khorvatia and Slavonia in order to calculate the anomaly of the horizontal magnetic field.

The author gives maps showing terrestrial isogons and horizontal isodynamics with isometrics of declination and horizontal tension, as well as a map showing the vectors of the horizontal component of the anomalous magnetic field. The distribution of anomalies is in absolute and interesting relation with the geological structure of the region.—V. Gorsky.

APPLICATION OF MAGNETIC METHOD OF PROSPECTION (IN SERBIAN)

By D. V. Frost and P. V. Gravirovsky

Rudarski i Topionički Vesnik (Bulletin of Mining and Metallurgical Industry) Belgrade, vol. 2, No. 6, 1930, pp. 269-273.

Two examples of magnetic survey carried out by Gravirovsky (Bureau des Réchérches Minières, Mulhouse, France) with Ad. Schmidt's vertical variometer in southern France are described.

In one case the extension of an ophite massif (positive anomaly of vertical intensity) below the alluvial cover was proved over a larger territory than could be expected from the outcrops of the ophite; this resulted in elimination of borings for salt (trias) and other unnecessary work.

The place of boring was established at the maximum negative anomaly of tical intensity.

In the second case the continuation of a fault in the oil-bearing gocene has been proved. Detailed data and the places of the survey are not en.--V. Gorsky.

3. SEISMIC METHODS

BUYING EARTHQUAKES IN SEARCH FOR OIL

By C. Van A. Pittman

The Oil and Gas Journal, vol. 29, No. 10, 1930, p. 129.

Seismic work necessitates the use of dynamite and often enough of it drive a seismic impulse a mile in depth to a point 10 miles distant on the face. Charges vary from 50 to 2,000 pounds, and sufficient noise must be duced to be detectable at the seismograph station so that its distance from shot point may be determined after proper corrections have been made for the locity of sound in air. A great deal was accomplished in developing portable ld seismographs (Fessenden, Karcher, Mintrop, Petty, McCollum and others) il they have reached their present stage of all-around general utility in physical exploration work.

Outstanding success has been attained in geophysical prospecting in Texas and Louisiana Gulf Coast fields and in southern Persia in the dis- very of salt domes. The same success will doubtless result from works in all other parts of the world in which reconnaissance surveys with the seismo- ph have already been made. Thus, the sale of earthquakes is rapidly becoming international business.

Graphs referring to Texas and the Gulf coast, given by the author, w the growth of increased efficiency on the part of seismologists and their truments and of the potential business that this new branch of applied ience is developing for dynamite manufacturers.--W. Ayvazoglou.

SEISMIC SURVEYS

Editorial note

Canadian Mining Journal, vol. 51, No. 24, 1930, p. 575.

This note is written in connection with the visit of Dr. R. Ambronn Canada. Dr. Ambronn reviewed the seismic field work carried out last winter southwestern Ontario near Tilbury and in the Turner Valley, Alberta.

A brief explanation of the method, as used by Ambronn, was discussed a conference of leading geologists and mathematicians at Ottawa.

A table shows the velocities for different materials:

Rocks	Average velocities, meters per second
Sands	600
Soft clays	1,000
Clayey shales	2,000
Sandstones	2,200
Marls	2,500
Slates	3,000
Limestones	5,000

A simple illustration to show how the theory works in practice is giv

The conclusion is drawn that by the seismic method it is possible to determine the petrological differences in the subsurface, together with the tectonic structure such as strike, dip, faults, synclines and anticlines,—and also the dip of the crests of anticlines and their deviations.—W. Ayvazoglou.

4. ELECTRICAL METHODS

GEOELECTRICAL EXPLORATION METHODS USED IN OIL FIELDS

By Helmer Hedstrom

The Oil Weekly, vol. 58, No. 6, July 25, 1930, pp. 34–37.

The article is essentially a presentation of the Sundberg electromagnetic method of prospecting.

An elementary explanation of the meaning of conductivity and resistan and the factors that affect the conductivity of rocks is followed by an example of the correlation of strata by measurement of the electrical resistance in the drill-hole walls but no information is given as to how these measurements were made. A brief description of two unsuccessful electrical methods and the cause of failure includes a curious confusion of ideas of electric current versus electric waves.

The Sundberg method consists in measuring the characteristics of the electromagnetic field produced by an alternating current in a wire and modified by the presence of conducting layers in the ground. An insulated copper cable several miles long is laid in a straight line on the ground, a return wire is brought round at a considerable distance from the cable, and observations are made at different distances from the cable on equally spaced transverse lines. The detecting instruments are a search coil, a "compensator," and an amplifier, but no details are given of their use or the resulting measurements, merely ver general statements as to the computation of depth to the "electrical key beds" and representation on a contour map.—Kenneth Hartley.

SOME EXPERIMENTS WITH EARTH CURRENTS

By Hiasi Noto

Japanese Journal of Astronomy and Geophysics, vol. 7, No. 3, March 10, 1930.

Introduction. The present investigation involves the stray currents in the subterranean section of a large city and especially the effects of electric railways. Only the general features are considered.

I. Preliminary experiments were made to study the magnitudes of some of the effects which could not be eliminated. The instruments used were a Dolezalek quadrant electrometer and a Siemens microammeter with a Wheatstone bridge for the current shunt.

1. The effect of the electrode metal was determined by using a sheet of copper for one electrode and various metals for the other electrode. The electrodes were buried 20 centimeters apart in a wooden box filled with loam. The potential difference was measured with the soil in natural condition, with distilled water around the electrodes, and with saturated salt water. The maximum observed difference was 67 millivolts.

2. To study the effect of the soil, one electrode of copper was buried in a mixture of loam and a small amount of sand. The other was buried in various media, including a similar mixture, river sand thoroughly washed and cleaned, loam, gravel about 3 to 5 millimeters in diameter, black humic soil under grass, and unwashed river sand. The maximum difference in potential was 2.8 millivolts for the humic soil, with the others was very much smaller.

3. The effect of acids and bases was determined with copper electrodes in various soils, adding NH_4OH, NaOH, KOH, HCl, or H_2SO_4. The maximum effects were observed with NH_4OH, being about 80 millivolts.

II. To study the distribution of natural stray currents, two lead balls about 4 centimeters in diameter were buried about 4 meters apart at various depths. The resistance was found to vary from about 550 ohms at a depth of 3 meters to about 1,200 ohms at 0.5 meters. The stray current varies widely in different districts. Near the summit of Mt. Tukuba the current was large compared with other districts free of artificial effects. Between a lightning conductor on the roof of the observatory at the summit and an electrode about 100 meters below that place, a current of about 1.07 milliamperes was found on a clear day. In a mountainous region, one of 0.05 milliamperes was found for that distance. In general, except for isolated peaks, stray currents are believed to be due to artificial causes.

V. Stray currents in a city. As a result of corrosion of a lead pipe buried in a concrete wall, the stray current was measured between the pipe and a copper earth plate, using a self-recording ammeter. The conclusions were mainly as follows:

1. Electric disturbances in the earth seem to originate from distant as well as near points, being detectable when all neighborhood sources are absent.

2. Stopping the water supply at the main station does not seem to affect the stray current.

3. A heavy rainfall causes a sudden increase in strength, due probably to decrease in resistance.

4. The amplitude of oscillation gradually changes over a long time wi no apparent cause.

5. Digging the earth near the electrode affects the current, and it is inferred that the effective layer of the earth is not over 6 meters.

6. A magnetic storm increased the current abnormally.

7. The current may be caused by a temperature difference between the electrodes, the passage of tram cars, or the difference in the metals of the two electrodes.

V. Stray currents from electric railways were studied from 2 to 4 a.m. when all electric cars within 100 kilometers were stopped, except for those under study.

1. Part I. June 20-24, 1929. The line from Higasikanagawa to Hatiozii was loaded and all other rails were insulated. The loading was either by a train or a special device. The train consisted of five electric locomotives with a maximum current of 1,000 amperes. The special de-- vice discharged about 1,000 amperes for 30 seconds. The total current was measured with a self-recording ammeter. The return circuit was either a feeder or a rail line. Four copper plates were connected by insulated wires, the plates being surrounded with carbon pieces to in sure good contact. The electrodes were buried about a meter deep. Electrode I was about 60 centimeters below the water line. Electrodes II was about 40 centimeters below the water line, about 200 meters away from I perpendicularly to the rail. Electrode III was about 40 centimeters below the water line. Electrode IV was about 30 meters above the water line, about 160 meters away from III in a line parall to the rail. A natural current of about 50 millivolts per 150 meters was cancelled by an impressed electromotive force. The general resul are:

a. An opposite current flowed for some time after the circuit wa opened, but only perpendicularly to the rail, due possibly to polarization.

b. The zero line is deflected as soon as the pantograph of the electric locomotive makes contact with the transmission line, when the switch is turned off, due probably to leakage.

c. The perpendicular current is larger than the parallel, the field being nearly perpendicular to the rail when the car is near.

A newspaper train from Tokyo to Yokosuka was also studied. The locotive weighed 92 tons, had a starting current of 150 amperes and a maximum urrent of 250 amperes. There were also two cars. Each time the train started, he record was affected, the deflection increasing as the train approached.

2. Part II. August 22-27, 1929. In this part of the investigation, the copper plates were replaced by special electrodes consisting of copper wire and a tube within a glass tube containing $CuSO_4$. The total resistance between the electrodes was about 2,600 ohms as compared with 40 to 60 ohms in the previous experiments. Two additional conclusions were made:

a. Currents in the ratios 10:7:5:2:1 caused deflections in the ratios 24:19:15:5:1. Thus the leakage is not proportional to the current discharged.

b. The first discharge of a group caused the largest deflection, indicating an electrochemical action tending to oppose the passage of the current flow.

c. In order to study natural currents, all artificial causes within at least 25 kilometers must be stopped, since the newspaper train showed noticeable effects at that distance. --Irwin Roman.

THE EARTH-RESISTIVITY METHOD OF ELECTRICAL PROSPECTING

By E. Lancaster-Jones

The Mining Magazine, vol. 42, No. 6, 1930, pp. 352-355; and vol. 43, No. 1, 1930, pp. 19-29.

The author describes the earth-resistivity method of electrical prosecting carried out with the Megger earth-tester. The article is divided into he following headings:

1. Field procedure.

2. Apparatus (a picture of the Megger earth-tester is given).

3. Consideration of results.

4. Application to prospecting for ore.

5. Mathematical theory of potential distribution in earth resistivity circuits (diagrams of characteristic curves are given.).

6. Test survey in Cumberland (two maps of the region surveyed, known as the Red Hill area, are given).

7. The Megger earth-tester (a diagrammatic representation of the system of components and connections) is shown in a figure.

8. Details of the test survey in Cumberland (sections across the area on the four marked lines are illustrated).

9. Conclusion.

The author says: "The test has shown that the more elaborate theory of earth-resistivity previously described is necessary to represent correctly the phenomena which occur in practical exploration. Even with this expansion in the theory, the observed data require careful and critical analysis if correct interpretations are to be obtained. Whilst it will generally be desirable to make a series of measurements at several electrode spacing intervals at each of a series of selected critical stations, a very valuable preliminary reconnaissance over the whole area can be obtained using only a single spacing interval, carefully chosen with reference to the most probable depth of the surface of which it is sought to map the features. For mapping subdrift or similar features, the method would appear to be very economical and promising, but further tests of typical regions are desirable to establish the correct principles or procedure and interpretation."

The total time spent in the field during the survey described was about one month and the personnel varied from three to four.--W. Ayvazoglou.

ELEKTROMAGNETISCHE AUSGLEICHSVORGÄNGE IN GESCHICHTETEM ERDREICH

(ELECTROMAGNETIC EQUALIZATION PROCESSES IN THE STRATIFIED SOIL)

By Franz Ollendorff

Archiv fuer Elektrotechnik, vol. 23, No. 3, 1930, pp. 261-278.

Contents of the article:

1. Introduction; purpose of the work.

2. Equations calculated for a steady field.

3. The electric field in case of a current impulse.

4. Series connections on the surface of the earth.

5. The origin of a short circuit current.

6. Numerical example.

The summary of the article, as given by Ollendorff, reads as follows:

The electromagnetic process of equalization in laminated conductors s examined; in particular the return-line arrangement of panels in homo- eneous soil with higher surface conductivity is represented by it.

The steady field is specified by an integral representation from which he field of a current impulse appearing suddenly can be derived by another ntegration. By interchanging the succession of the integration, element- ry and complete expressions for the arrangement of panels can be derived. ear the line (Nahzone) fields of highest voltage appear immediately after he closing of the circuit, while for more distant places a certain time is equired until the disturbance produces the maximum effect. From this a icroscopic velocity of propagation of the spreading process can be defined hich is proved to be the constant of the electrical plate-data.

From the field of a current impulse the processes of equalization can e calculated by elementary integrations; they correspond to a direct cur- ent increasing exponentially, or to an alternating current appearing sud- enly. It is shown that in the first case the field of connection de- reases slowly, after the passing of a maximum, in an inverse ratio of time.

The maximum value itself is estimated; it is considerably smaller than he excess voltage appearing during a sudden rise of the current. The utual inductance which is decisive for this is limited, under average con- itions, by the value of the order of from $0.5 \cdot 10^{-3}$ m. Henry/km.; it de- ends logarithmically only to an extremely small degree on the distance of he lines influencing one another. For the alternating current method of connection there results a similar estimation, that the stationary voltage is just of the same value as the maximum connection voltage, so that an excess voltage which is twice as much as the stationary voltage appears.

If the voltage impulse is put directly on the closed circuit a short ircuit current is developed. For the progress of this short circuit cur- ent a Volterra's integral equation is derived which can be solved by the pproximation proceeding. It was found that the current increases in the eginning very quickly, about linearly, later more slowly, but never be- omes stationary under the assumptions mentioned above.

The impossibility of definition of a stationary condition forms a haracteristic feature of the process of connections discussed in this rticle.

The conditions of the process of connections inside of the soil is examined by means of several numerical examples. The intention is to ex- tend the method used here for the disclosure of the connecting circuit in a semi-space limited by planes.--Author's abstract translated by W. Ayvazoglou.

SULLA MISURA DI CAMPI ELETTROMAGNETICI DI UNA CORRENTE ALTERNATA IMPRESSA AL SUOLO

(ON THE MEASUREMENT OF ELECTROMAGNETIC FIELDS PRODUCED ON THE GROUND BY ALTERNATING CURRENT)

By Arnaldo Belluigi

Ergänzungshefte fuer Angewandte Geophysik, vol. 1, No. 1, 1930, pp. 4-8.

A new method by means of which the electromagnetic field produced by an alternating current can be measured in making geoelectric investigations is discussed.

The author draws attention to the defects of different efforts made so far for the solution of this question.--Author's abstract translated by W. Ayvazoglou.

ELECTRICAL METHODS OF PROSPECTING (IN SERBIAN)

By S. Verbič

Rudarski i Topionički Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 2, No. 5, 1930, pp. 223-226.

The author gives a brief systematic outline and classification of electrical methods of prospection, as well as a comparison of the methods.--V. Gorsky

A CRITICAL REVIEW OF DIFFERENT ELECTRICAL METHODS OF PROSPECTING AND A LABORATORY STUDY OF ONE OF THESE METHODS (IN SLOVENIAN)

By V. Gorsky

Manuscript published by the Institute of the Surveying of Mines at the University at Ljubljana in Yugoslavia, 1926, pp. 1-150.

The author compares the different methods of electrical prospecting and gives maps and numerical data on the results of the laboratory studies of the equipotential method. The measurements were made on different iron, glass, and wooden models buried in different positions in a box filled with sand. The application of different kinds of current (alternating, direct, different intensity), different electrodes and apparatus was studied. Methods of measurements were tried out in order to establish the most suitable one for studying the deformation of the equipotential lines with relation to the form and position of the body. A study was made of the most simple method of direct measurement of the potential difference by means of a voltmeter connected between one primary electrode and one single point electrode. Difficulties, advantages, and defects of the method and possibilities of its improvement are discussed.--Author's abstract.

COMMUNICATION SUR LES RECHERCHES ÉLECTRIQUES DE MINERAIS ET D'HUILES

(COMMUNICATION ON ELECTRICAL METHODS OF SEARCHING FOR MINERALS AND OILS)

By K. Sundberg and H. Hedstrom

II-e Congrès International de Forage, Paris, 16-23 Sept., 1929.
Special print issued in Saint-Etienne, 1929, pp. 1-19.

The authors describe the importance, nature, and practical application f electrical methods of prospecting (especially Swedish) for ores and oil. The llowing diagrams are given:

1. Vector diagram showing horizontal component of electromagnetic ield at the surface 100 meters from the primary cable. It is evident from this iagram that if only one conducting layer is present at a certain depth under the rface, then both the depth and the electric properties of this layer can be de- ermined with the Sundberg electromagnetic method by measuring the horizontal omponent of the electromagnetic field at one single point (there are similar iagrams for the vertical component).

2. Relation between resistance factor P and per cent of volume V of ater in rocks, and

3. Relation between chlorine content of waters and their specific lectrical resistance.--V. Gorsky.

SUR LA DÉTERMINATION ÉLECTROMAGNETIQUE DU PENDAGE DES COUCHES SEDIMENTAIRES

(ON THE ELECTROMAGNETIC DETERMINATION OF THE HANG OF SEDIMENTARY DEPOSITS)

By C. and M. Schlumberger

L'écho des mines et de la metallurgie, vol. 58, No. 3032, 1930, pp. 473-474.

The anisotropy of sedimentary formations makes it possible to carry out lectrical studies of the hang[1] of underlying deposits; this constitutes the ractical problem in geophysical research work in case a direct geological obser- ation is impossible.

A brief description of theoretical proceedings and practical confirma- ion of these studies is given.--W. Ayvazoglou.

---

[1] - Hang - the hade of a fault.

6. GEOTHERMAL METHODS

THE EFFECT OF TEMPERATURE DISTRIBUTION ON THE DEFORMATION OF A SEMI-INFINITE ELASTIC BODY

By G. Nishimura

Bulletin of the Earthquake Research Institute, Tokyo Imperial University, vol. 8, part 2, 1930, pp. 91-143.

Nishimura studies the problem of the effect of the temperature distribution and variation in the neighborhood of the surface upon the form of the earth crust.

The mathematical part of the article consists of three parts: In the first the author has obtained the general equations of equilibrium of the elastic solid when the variations of temperature occur; in the second part the two-dimensional problem is discussed; in the third part the three-dimensional problem is discussed; in these last two parts some examples have been solved by using Fourier's double integral formula.

In his résumé the author says:

Some results are obtained which may be interesting on the geophysical problems and of which the principal facts are enumerated as follows:

1. The magnitude of the displacement at a given point in the solid is proportional to the temperature at that point.

2. The surface distribution of displacements is, of course, affected by the temperature distribution of the surface, and especially by the distribution in the interior of the body; i.e., the displacement or the tilt of the surface of the solid is inversely proportional to $(1+\beta')$ where β' is a constant which specifies the temperature distribution in the interior of the solid.

3. The surface displacement becomes maximum when the temperature distribution is constant through the whole depth of the interior of the solid.

4. Even when the surface temperature is discontinuous, the surface, as well as internal deformation of the body is continuous and in this case the portion of no temperature change is also deformed.

5. Even if the temperature distribution of the surface of the solid is of a decided nature, the surface deformation of the solid has a moderate nature.

6. When the temperature distribution of the surface of the solid is assigned to be of a certain decided nature, the change of the surface displacement due to the small variation of the temperature distribution in the interior of the solid is very marked."--W. Ayvazoglou.

GEOELECTRIC PROSPECTING FOR ORE

By Arnaldo Zabelli

The Mining Journal, vol. 170, No. 4955, 1930, pp. 641-642.

Under this title the author discusses briefly the subject of natural oelectric current for the search of sulphur minerals and oscillatory currents tificially produced in the ground for the search of insulating minerals (for stance sulphur and petrol).--Author's abstract.

SUR LES MESURES DE TEMPERATURE DANS LES SONDAGES

(THE MEASUREMENT OF TEMPERATURE IN BOREHOLES)

Editorial note

L'écho des mines et de la Métallurgie, vol. 58, No. 3029, 1930, pp. 384-385.

The use of a special thermometer, the tube of which is cut obliquely its upper end at an angle of 45° to the axis of the tube, is recommended and e carrying out of observations of the temperature in boreholes by means of ese thermometers is described (See Geophys. Abs. No. 14, p. 16, Friedel and ikowsky, "Measurement of temperature in boreholes").--W. Ayvazoglou.

7. UNCLASSIFIED METHODS

THE PRINCIPLES OF GEOPHYSICAL SURVEYING

By Henry Briggs

Colliery Engineering, vol. 7, Nos. 75 and 76, pp. 178-184, 187, 202-206.

Before starting with the examination of geophysical methods of pros- cting Briggs makes some remarks on the conditions of geophysical prospecting general, based on the fact that the attitude of scepticism established in is connection some 10 or 12 years ago is no longer encountered and the aysicist is permanently established in the position he has captured in the ining world.

Application to Coal Mining. Although the methods have so far been plied to oil and metalliferous practice only, the author is of the opinion that ophysical prospecting can be of practical consequence in coal mining also.

Trustworthiness of results. All geophysical processes depend on the easurement of variations of some kind or other. They give merely negative sults unless differences exist in the forces or effects with which they are ncerned. The more pronounced the differences the clearer the indications ey provide and the more certain the conclusions drawn from them. Geophysical ocesses gain in trustworthiness by being applied in combination.

Common-sense basis of geophysical surveying. The first thing is that l the methods rest upon accepted and proved tenets of physical science. In

the second place the geophysical surveyor must not allow himself to be carried away by an undue optimism. He has to admit many failures just as he can point to many signal successes. With the growth of experience the skilled observer is becoming better able to assess the chances of success of any proposition that may be put to him.

Geophysics the handmaid of geology. Geological guidance is a most important factor, and the more completely the general geological structure of district is known the simpler is the geophysicist's task and the more reliable his results.

The origin of the methods and the literature on geophysical surveying are mentioned briefly. After these introductory remarks the author goes over to the discussion of the different methods:

Magnetic methods, their principles, instruments used and applications shown on several examples, are examined in the first part of the article (vol. 7, No. 75). The second part (vol. 7, No. 76) deals with electrical methods of prospecting. A series of figures, diagrams, and graphs accompany both parts. The article is to be continued.--W. Ayvazoglou.

THE APPLICATION OF GEOPHYSICS TO MINING, WITH SPECIAL REFERENCE TO THE LOCATION OF FAULTS

By Capt. H. Shaw

The Institution of Mining Engineers, London, Transactions, vol. 79, part 2, 1930, pp. 130-145.

The four general methods are considered and the fundamental principle given in each case, after which their application to mining, particularly to the location of faults, is discussed.

A table of magnetic susceptibilities is included, and Slichter's figure is given of the limiting value of the susceptibility, below which no recognisable effect can be obtained. The location of faults by electrical methods is considered briefly, after which the gravitational method is outlined and its practical applications, such as the location of faults, structural features, dykes, ore masses, buried river beds, etc., referred to.

The seismic method is explained and the problems of determining the depth of cover and of locating simple faults are considered.

The time-distance curves obtained along a profile across a known fault at Hodbarrow are reproduced and compared with the curves to be expected from theoretical considerations.

The paper concludes with a table in which are set out the various methods, their applications, and their limitations.--Author's abstract.

THE IMPORTANCE OF APPLIED GEOPHYSICS FOR THE MINING INDUSTRY (IN SLOVENIAN)

By V. Gorsky.

Manuscript published by the Institute of the Surveying of Mines at the University of Ljubljana in Yugoslavia, 1926, pp. 1-221.

In this work the author gives an outline of the conditions, successes d estimations of the present and future importance of geophysical methods of ospecting in the mining industry, based on the literature published up to 25, inclusive.--Author's abstract.

GEOPHYSICAL METHODS OF PROSPECTING AND THEIR IMPORTANCE TO YUGOSLAVIA (IN SERBIAN)

By D. V. Frost

Rudarski i Topionički Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 2, No. 2, 1930, pp. 57-59.

A brief description is given of the principles of geophysical methods prospecting and of the importance of their application in Yugoslavia.--V. rsky.

MEASURING THE DEPTH OF DEEP WELLS

By C. E. Van Orstrand

Reprint from the Oil and Gas Journal, issue of March 8, 1928, 2 pp.

In this article Van Orstrand examines the various obstacles that pre- nt the precise measurement of the depth of a deep well, such as:

1. Thermal expansion.
2. Deviation from the vertical.
3. Sounding bottom.
4. Sliding friction.

The inaccuracies involved by these obstacles are more or less common all methods of deep well measurement which are dependent on lowering a material ject to the bottom of the well. In the following the author discusses the rors inherent in the individual methods themselves:

1. Measurements on casing and drill pipe.
2. Stringing over the derrick.

In discussing the possibility of devising a machine that will accura ly record the depth of a deep well the author says that the numerous attempts made on this subject have remained so far without success. Two views of a fle ible type of machine that the author uses for measuring the depths to which thermometers are lowered into deep wells while making temperature tests are gi the operation of the machines is described.

A proposed arrangement of measuring wheels and guiding pulleys which has been designed to meet three fundamental and necessary requirements in the construction of a measuring machine--namely, stability, flexibility, and an equalized distribution of load on the cable--is shown in a figure.

In conclusion the author expresses the opinion that even assuming th a perfect measuring machine can be constructed, the fact remains that the true depth of a well can not be determined--the point determined by the "pick up" can not be accurately located and the measurement of the depth is dependent on drag of the line and bailer on the casing as the cable is removed from the well W. Ayvazoglou.

A NEW GEOPHONE

By C. A. Heiland

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 330, 1930, 10 pp.

The new geophone described in this paper was developed by the author and Charles H. Hull. After a brief description of the principles of the geoph Heiland comments upon the work done on it during and after the war by the Bure of Mines.

Publications issued by the Bureau of Mines concerning the geophone i which the possibility of using the geophone in mining is discussed are mention

The author divides his article into the following main parts:

1. Applications of the geophone.
2. Sensitivity of the geophone.
3. Quantitative tests with geophone.
4. The new geophone.

In the last part Heiland gives a description of his method. Two fig showing (1) the new (push-pull) geophone arranged for visual observation and (geophones arranged for use, are added.--W. Ayvazoglou.

8. GEOLOGY

GABBRO-MASSIF NEAR JABLANICA (IN SERBIAN)

By L. Marić

Bulletin de l'institut géologique de Zagreb (Yugoslavia), vol. 2, 1927 28, pp. 1-65.

The author gives a detailed mineralogic-petrographical description of e gabbro-massif near Jablanica on the border of Bosnia and Herzegovina.

The author proves that there is no contact zone at the border of the ssif by which it may be proved that the gabbro intrusion is younger than the ias, as is asserted by Katzer and Kossmat. Investigations carried out by the thor confirm Kispatic's opinion that the origin of gabbro, as well as all the hiolite rocks of the "serpentine zone" of Bosnia, must be assigned to older mes than the sedimentary rocks in which they are intruded. The position of e gabbro-massif is defined also by strong geodynamic processes occurring in is region.

The investigations may be of interest also from the viewpoint of ap- ied geophysics. The gabbro described is rich in magnetic and must cause mag- tic anomaly.

By means of magnetic measurements the existence or absence of a mutual lation at a certain depth of single gabbro-massives scattered in Bosnia could determined, and the study of tectonics and stratigraphic position of the ser- ntine zone in Bosnia could be made more clear.--V. Gorsky.

BAUXITES IN HERZEGOVINA, ESPECIALLY IN THE REGION OF MOSTAR (IN SERBIAN)

By T. Jaksić

Bulletin de l'Institut Géologique de Zagreb (Yugoslavia), vol. 2, 1927 28, pp. 82-120.

The author describes the bauxite deposits in Herzegovina. Owing to the ry favorable situation and forms of these deposits they may serve with great ccess for detailed magnetic measurements in order to establish the possibilities r magnetometric prospection of bauxites in general.--V. Gorsky.

9. NEW BOOKS

Handbuch der Geophysik (Handbook of Geophysics). Seismometer, Auswertung der Diagramme (Seismometer, Evaluation of Diagrams), by H. P. Berlage; Geologie der Erdbeben (Geology of Earthquakes), by A. Sieberg. Vol. 4, part 2, 1930, pp. 299-686, 255 figs. Gebrüder Bornträger, Berlin. Price, 30 M.

Hosmer, George L. Geodesy, Including Astronomical Observations, Gravity Measurements, and Method of Least Squares. Second edition. New York, John Wiley and Sons, Inc. London, Chapman and Hall, Ltd. Price, 22 s. 6 d. net.

Boutry, G. A. Les Méthodes Géophysiques de Prospection Appliquées a la Réchérche du Pétrole (Geophysical Methods of Prospecting as Applied to the Search for Oil). Paper covers, 172 pp. illustrated. Price 20 francs. Paris, La Révue Pétrolifière. The book concludes with a bibliography of publications on the subject of geophysics.

Maurin, Ch. Le Méthodes Géophysiques pour l'Étude des Couches Superficielles du Sol (Geophysical Methods for Studying Superficial Deposits). Paper covers, 29 pp. illustrated. Price, 10 francs. Paris, La Revue Pétrolifi... A useful list of references is added. This is a reprint of two articles which appeared in Nos. 322 and 323, 1929, of La Révue Pétrolifière.

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GEOPHYSICAL ABSTRACTS[1]

No. 18

Compiled by Frederick W. Lee[2]

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[1] - The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6393."

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1. GRAVITATIONAL METHODS

TORSION-BALANCE SURVEY OF ESPERSON SALT DOME, LIBERTY COUNTY, TEX.

By Donald C. Barton

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 9, 1930, pp. 1129-1145.

The Esperson salt dome was discovered in a torsion balance survey made by the Union Exploration Co. late in 1928. The discovery well of the oil field on the dome was completed in the summer of 1929. The torsion balance survey showed the presence of (1) a large minimum indicating the Esperson dome, (2) a similar minimum due to the South Liberty-Dayton salt dome, and (3) two maxima, one of them due to the interference effect of the Esperson and South Liberty-Dayton minima, and the other to the interference effect of the Esperson minimum and the minima of the Moss Bluff, Lost Lake, and Barbers Hill salt domes. The approximate form and position of the Esperson dome on a northeast-southwest profile were calculated by the writer's chart method. The calculations seem to indicate that the respective salt cores of the Esperson and South Liberty-Dayton domes must extend to a depth of 15,000 ± feet and be broader at the base than at the top. The center of the Esperson minimum is shifted about one-half mile south-southeastward from the center of uplift as approximately defined by drilling. Shifts of the center of the minimum away from the center of uplift may be due to (1) asymmetry of the dome, (2) regional gradient, (3) a spine of salt rising into the neutral zone, (4) local anomalies.

A certain degree of indefiniteness is inherent in the torsion balance indication of the exact position and depth of a deep salt dome, but additional uncertainty is produced by some methods of interpretation. The torsion balance data offer no criteria for determination of the presence or absence of deformation of the super-salt beds. Four types of gravity maxima may be present in the Gulf Coast region: (1) Salt dome maxima produced by shallow salt domes, (2) interdome maxima produced by the interference effect of the salt-dome minima, (3) structural maxima, and (4) sedimentary maxima.--Author's abstract.

ADJUSTMENT OF GRADIENT OF TORSION BALANCE AND APPLICATION OF UNDULATION METHOD TO GRAVITY MEASUREMENTS

By J. G. Koenigsberger

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 9, 1930, pp. 1221-1224.

A very good control and adjustment of surveys made with a magnetometer or with a torsion balance based on the least-square method and especially fitted for scalars or for vectors of only one direction has been given by Donald C. Barton.

For the gradient vector observed with the torsion balance, the author proposes a method not very accurate but easy, by which two problems can be

olved, if the inhomogeneities of terrain and the errors of the instrument vary rregularly from station to station, disturbing the results. The two problems re:

1) To find the isogams, and (2) to find the regional trend of the gradient so hat it can be subtracted from the local values.

The method is briefly described.--W. Ayvazoglou.

SCHWEREMESSUNGEN UND GEBIRGSBAU IM RIESEN-GEBIRGE

(GRAVITY MEASUREMENTS AND OROGRAPHY OF THE RIESEN-GEBIRGE)

By Robert Swinner

Jahrbuch der Preussischen Geologischen Landesanstalt zu Berlin, vol. 49, part 1, 1928, pp. 270-278.

The author gives a description of the structure of the Riesen-Gebirge based on the numerous geological investigations. In conclusion he says that to complete the geological work, geophysical methods of investigation of the area should be applied, as those points which could not be reached by geologic survey may offer results by which not only the knowledge of special structures could be increased but also a better understanding of the process of intrusion of deep rocks could be obtained.--W. Ayvazoglou.

2. MAGNETIC METHODS

DIE SÄKULARVARIATION IN DER RHEINPFALZ IN DEN JAHREN 1850 BIS 1928

(SECULAR VARIATION IN THE RHINE PALATINATE IN THE YEARS FROM 1850 TO 1928)

By Fr. Burmeister

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 186-190.

The results of new magnetic measurements carried out in the Palatinate ere compared with those obtained by J. von Lamont in 1852 and G. von Neumayer in 855-56. The new measurements were made by the author of this article in 1927-28. Sixty stations, about 10 kilometers distant one from another, were covered. Stations selected by former observers were used, if possible. Working out of the new survey of the Palatinate is almost completed; its results concerning the changes of the magnetic elements (declination, horizontal intensity, inclination) are shown in a table.

An error in Neumayer's measurements caused by neglect by him of the meridian convergence, which for this place amounts to about 32 feet, was discovered.--W. Ayvazoglou.

GRÖSSENVERHÄLTNIS VON REMANENTEM ZU INDUZIERTEM MAGNETISMUS IN GESTEINEN; GRÖSSE UND RICHTUNG DES REMANENTEN MAGNETISMUS

(PROPORTION IN VALUES OF THE REMANENT MAGNETISM TO THE INDUCED MAGNETISM IN ROCKS; VALUE AND DIRECTION OF THE REMANENT MAGNETISM)

By J. Koenigsberger

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 190-207.

The rocks, partly in oriented cubes, were examined according to Brunhes and David, with regard to the direction and amount of the remanent magnetism J per cubic centimeter in values of Γ; they were placed in a highly sensitive astatic system of two pairs of magnets. For the determination of the susceptibility K at about 10 Γ, a cube surface was compared with one of the four magnets according to the image method; measurements on the six surfaces have shown also anisotropy and heterogeneity of K. In tables are given: K, J, J : J_K (J_K = K times of the present total intensity), the heterogeneity "u" and the anisotropy "a" with respect to the three cube normals, both with relation to the mean value of K = 1. For deep rocks J : $J_K < 1$, for eruptive rocks usually from < 1 to 10, for lavas about 10, and for a modified quartz porphyry is 75. K decreases only slightly from 15 to 1.5 Γ with the decreasing intensity of field; therefore the K in the earth field calculated in nature from topographic effects corresponds within the error limits of 20 per cent to the K measured in the laboratory. The remanent magnetization often changes its direction very strongly in the same deep-rock masses and eruptive-rock masses, so that the conclusions drawn on the previous magnetic fields are not always reliable.--Author abstract translated by W. Ayvazoglou.

ÜBER EINE MAGNETISCHE ANOMALIE AM LEBASEE IN OSTPOMMERN

(CONCERNING THE MAGNETIC ANOMALY ON THE LEBA-SEA IN EAST POMERANIA)

By H. Reich

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 207-216.

The author describes the results of his measurements carried out in 1927-28 in East Pomerania on the magnetic anomalies in this region. Ad. Schmidt local variometers were used. Z-measurements were considered almost exclusively. A map showing the Z-disturbances is given. According to this map the positive magnetic disturbances are marked by two ranges extending from WSW to ENE; the northern range, which extends along the shore, shows a remarkable relationship with the present course of the coast. A disturbance to the west of Leba was examined closely. The disturbance was reduced to an eruptive body about 1 kilometer wide and 12 kilometers long situated at a depth of over 600 meters and extending from east to west. A figure showing the Z-isanomalies and another showing the H-isanomalies of the region are given. The H-measurements can not be considered of an equal value to the Z-measurements owing to the fact that the H-variometer did not work as well as the Z-variometer. The mean errors of the Z-measurements reached about ± 10 γ while those of the H-measurements were about ± 20 γ.

A full description of the results of the work will appear later.--W. Ayvazoglou.

DIE ERGEBNISSE DER MAGNETISCHEN MESSUNGEN IN DER OSTSEE IN DEN JAHREN 1924 BIS 1929

(RESULTS OF MAGNETIC MEASUREMENTS IN THE BALTIC SEA DURING THE YEARS FROM 1924 TO 1929)

By A. V. Gernet

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 216-220.

The measurements were started on July 10, 1924, and were continued every summer up to 1929, inclusive. In all, 511 stations were covered. The distribution of the stations was as follows: 117 in Sweden and Finland, 102 in Latvia, 52 in Germany, and 240 in Esthonia.

The author worked out only the measurement carried out in Esthonia. The results of the Swedish-Finnish measurements are published by the Swedish Hydrographic Department and the Finnish Meteorological Central Institution under the title "Magnetic Measurements in the Baltic Sea, South Quarken, first report, and South Quarken and Northern Coast of the Baltic Sea, second report."

The results of Latvia are to be published during this year. The time of the publication of the results of measurements made along the German coast is unknown.

The results of the measurements made in Esthonia are represented by the author in this article by means of three schematic maps, showing the vertical intensity, horizontal intensity, and declination, respectively. All the values are reduced to 1926.5. The maps must be considered to be of a temporary character, as they will be completed by measurements to be made in 1930.

The distribution of the elements of the earth magnetism in the region examined is very irregular. Undisturbed values form an exception. The author notices that the greatest disturbances have their origin on the continent near the shore. Their influence is clearly shown on the water.--W. Ayvazoglou.

ERDMAGNETISCHE MESSUNGEN IN BULGARIEN, MAZEDONIEN, THRAZIEN UND IN DER DOBRUDJA

(EARTHMAGNETIC MEASUREMENTS IN BULGARIA, MACEDONIA, THRACE, AND DOBRUDJA)

By Kyrill Popoff

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 221-224.

The author carried out in 1917-1920 a series of earthmagnetic measurements with Schulze's differential magnetometer No. 18. Astronomic observations were made with the Starke-Kammerer N Theodolite.

The comprehensive tables of the single results were given a reduced form by A. Nippoldt. These tables are added to the article. The values of the magnetic elements represent the mean values of the single values of the measurements.--W. Ayvazoglou.

EINIGE BEMERKUNGEN ÜBER ERDMAGNETISCHE MESSUNGEN WELCHE IN FEODOSSIA AUSGEFÜHRT WURDEN

(SOME REMARKS ON EARTHMAGNETIC MEASUREMENTS CARRIED OUT IN FEODOSIA)

By L. Palazzo

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 225-227.

In this article Palazzo mentions the earthmagnetic determinations made by him in Feodosia in 1914 which, in his opinion, are to be added to Weinberg's "Catalogue of Magnetic Determinations in the U. S. S. R. and in Adjacent Countries from 1556 to 1926," published in Leningrad in 1929.

The purpose of this paper consists not only in filling up the omissio of Palazzo's data in the catalogue but mainly of drawing conclusions concerning the magnetic secular variations in Feodosia. The author compares the data of the declination obtained by him with the new measurements made in 1924 and 1928 by Loidis and shows the conformity of the value obtained by the calculation fro his formula with that given by Loidis ($D = +2^{\circ}\ 10.6'$ and $D = 2^{\circ}\ 11'$, respectively).

The difference of H obtained by calculation and observed by Loidis ($H = 0.22794$ and $H = 0.23005$, respectively) is, of course, greater and is explained by the author by the fact that the force H diminished from 1914 to 1928 probably in a smaller proportion than assumed in his formula.--W. Ayvazoglou.

POSSIBLE CAUSES OF ABNORMAL POLARIZATION OF MAGNETIC FORMATIONS

By C.A. Heiland

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 228-235.

Extensive magnetic local measurements were carried out with Ad. Schmidt's field balance during the last three years in the United States. The region measured comprised more than 1,000,000 square kilometers, the greatest part of which has been investigated in connection with oil geology. The application of the magnetic method in oil geology rests upon the fact that oil anticlines often remain in connection with raisings of the crystalline subsoil. Anticlines develop either by the filling up of old buried ridges and higher pressure of the thicker sediments situated at the flanks, or by folding up of crystalline subsoil together with the covering stratum, or finally by volcanic intrusion into the sediments.

The material obtained by these measurements, as well as by the measurements carried out in connection with mining, contributed much to the enlargement of our experience in the interpretation of the results and has in the first place shown that the pure induction theory can not be applied to the exte sometimes stated in recent publications.

So far the importance of mechanical-geologic forces has been under-
ued in general. Experiments proved that a combined application of tractive
rce and twisting force sometimes caused a reverse magnetization in the normal
rth field; variations in the magnitude of the permanent magnetization of mag-
tite can plausibly be attributed also to the differences in conditions of
essure and temperature during its formation; the reverse magnetization of ore
dies can in many cases be explained by tipping over of deposits after their
gnetization; the change of positive and negative anomalies in basalt-flow de-
nds probably also on the congelation of single particles as well as their tip-
ng over during the plastic flow of the cover. Therefore it seems hopeless to
rive the direction of the inclination of the earth field in former geological
riods from the present direction of magnetization. On the other hand it can
proved that a large number of negative anomalies which were observed over
evated points of paramagnetic formation can also be explained by normal induc-
on; this applies in the following cases. (1) If ore bodies or (2) intrusive
ins or magnetite bands along the texture, forming a part of the disturbing
dies of irregular surface, dip flatly to the south; (3) if the magnetite con-
nt is submitted to strong local variations probably due to the subterranean
oling inside of the same (mostly volcanic) formation; (4) if the opposite mag-
tism in a small deposit is induced by an adjacent larger deposit, or finally
) if, for example, granite was intruded in primitive rocks in magnetically
ronger mica-slate and the latter was eroded, so that the thickness of the
gnetic formation above the center of intrusion decreased.--Author's abstract
anslated by W. Ayvazoglou.

DIE GEOLOGISCHE BEDEUTUNG DER SCHAFFUNG EINER ISANOMALIEN KARTE DER MAGNETISCHEN VERTICALINTENSITÄT VON DEUTSCHLAND

(GEOLOGICAL IMPORTANCE OF PREPARING A MAP OF ISANOMALIES OF THE MAGNETIC VERTICAL INTENSITY OF GERMANY)

By Friedr. Schuh

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 235-248.

A series of reasons is given which demonstrate the importance of creat-
g a magnetic map of isanomalies of Germany for the geological investigation.
this occasion the author indicates also that even now the position of the
ttelmeer-Mösenzone Stilles, between central Germany and Christianiagraben,
uld be determined with a greater accuracy by means of data obtained from the
w magnetic investigations in Holstein and Mecklenburg. Several propositions
r carrying out these measurements are made.--Author's abstract translated by
A Ayvazoglou.

DIE INNERE GENAUIGKEIT VON INKLINATION MESSUNGEN MIT DEM ERDINDUKTOR

(THE INNER ACCURACY OF MEASUREMENTS OF INCLINATION WITH THE EARTH INDUCTOR)

By O. Venske

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 248-251.

The author discusses the causes of the differences between inclination
alues which are observed with the earth inductor in two different positions of

the circle of altitude. He mentions cases in which the determination of these differences can not be established and examines proceedings by which some of them may be reduced to a great extent or even eliminated entirely.--W. Ayvazoglou.

THEORIE EINER NEUEN GALVANISCHEN WAAGE

(THEORY OF A NEW GALVANIC BALANCE)

By R. Bock

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 251-253.

The applicability of a balance based on the galvanic principle is discussed. Mathematical calculations of the theory are given. According to the author the construction of such a "galvanic balance," which is started already, is entirely justified.--W. Ayvazoglou.

MESSUNGEN IM LUFTSCHIFF

(MEASUREMENTS IN AN AIRSHIP)

By K. Haussmann

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 253-255.

In connection with the fundamental principles established by Ad. Schmidt for magnetic measurements in an airship and suitable adjusting of instruments required for this purpose, the author undertook in December, 1928, an experimental trip in the zeppelin from Friedrichshaven to Ulm, passing above the Bodensee.

The results of observations are summed up by Haussmann as follows: In case of good weather and suitably constructed instruments the magnetic horizontal and vertical intensities can be measured; in places the measurements of declination of which are not available, suitable data of these magnetic elements can be obtained if the position of the airship can be determined with sufficient accuracy.--W. Ayvazoglou.

UNE MODIFICATION DE L'APPAREIL ENREGISTREUR A MARCHE RAPIDE ET À PETITE CONSOMMATION DE PAPIER DE AD. SCHMIDT POUR L'APPLICATION AUX STATIONS DE L'ANNÉE POLAIRE 1932-1933

(A MODIFICATION OF THE REGISTERING ARRANGEMENT WITH A WIDE TIME-SCALE AND ECONOMICAL CONSUMPTION OF PAPER DESIGNED BY AD. SCHMIDT, FOR USE ON STATIONS DURING THE POLAR YEAR 1932-1933)

By D. la Cour

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 255-258.

Owing to the fact that the usual movement of the registering arrangement at a rate of 15 millimeters per hour as exists in most of the magnetic

servations is not sufficient for special investigations, Prof. Ad. Schmidt
pposed a method by which the registration can be obtained at a greater rate
speed and wider time-scale without either the increase of the consumption of
e expensive paper or the work necessary for the development of the curves
gistered. In order to obtain a model by which quick variations of the three
gnetic elements could be registered simultaneously, experiments have been
arted in the observatory at Copenhagen where such an experimental apparatus
already at work.

The principles of this apparatus are described in this article and a
heme of its arrangement is given. A copy of the first registrations (of
ne 12) is shown in a figure.--W. Ayvazoglou.

WAS SAGEN UNS DIE PARAMETER EINES MAGNETEN?

(WHAT DO THE PARAMETERS OF A MAGNET TELL US?)

By G. Fanselau

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 258-262.

The representation of the potential of a magnet with the aid of the
-called parameters (series of spherical functions (Kugelfunktionsreihen)) is
mpared with the representation resulting from the volume magnetization of the
gnet; in this way the parameters are brought into connection with the volume
gnetization.

By the division of the magnet, investigation of the distribution of
e magnetization inside of the magnet becomes possible.--Author's abstract
ranslated by W. Ayvazoglou.

UEBER DIE HERLEITUNG DES POTENTIALS DES TÄGLICHEN
ERDMAGNETISCHEN VARIATIONS FELDES

(ON THE CALCULATION OF THE POTENTIAL OF THE DIURNAL EARTHMAGNETIC
FIELD OF VARIATION)

By J. Egedal

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 263-265.

As early as 1903 Prof. Ad. Schmidt pointed out that the diurnal vari-
tions of the earthmagnetic field are not equal for the stations situated at
he same latitude. Therefore in calculating the potential of the earthmagnetic
ield of variation, not only the geographic but also the geomagnetic coordinates
ust be taken into consideration.

In this article Egedal discusses, based on an example, the insuf-
iciency of the old method of calculation. He concludes that the necessity of
he change in calculation is evident and expresses the hope that the new method
ill be adopted.--W. Ayvazoglou.

ÜBER DEN VEKTOR DER MAGNETISCHEN STÖRUNG IM APERIODISCHEN VERLAUF

(ON THE VECTOR OF THE MAGNETIC DISTURBANCE IN THE APERIODIC COURSE)

By J. Kerŭnen

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 265-271.

It is well known that the course of the earthmagnetic force, after being freed from periodical deviations, is characterized by the phenomenon of after-disturbance. In the data given by some observatories this course is derived from the mean values at different hours. Ad. Schmidt called this process the "aperiodic disturbance." The vector of the disturbance has at each place a certain direction which lies almost in the plane passing through the axes of the homogeneous magnetization of the earth and of the place. The vector is called, according to its inventor, the Broun's vector. Based on the results obtained from investigations made on the most important properties of the aperiodic vector of disturbance, the author draws the conclusion that the vector of disturbance in the aperiodic course has on the average a horizontal direction equal to that of the usual Broun's vector. This property was very distinctly shown in Sodankylä and Batavia, that is in the polar, as well as the equatorial regions.--Ayvazoglou.

FORSCHUNGSMETHODEN ÜBER DEN ZUSAMMENHANG ZWISCHEN DER SONNENFLECKENTÄTIGKEIT UND DEN ERDMAGNETISCHEN STÖRUNGEN

(METHODS OF INVESTIGATION ON THE CORRELATION BETWEEN THE ACTIVITY OF SUN SPOTS AND EARTHMAGNETIC DISTURBANCES)

By E. Gehlinsch

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 271-284.

In this article the author discusses the most important methods of investigation of the activity of the sun spots and of the variations of the earth magnetic fields. The following conclusions are drawn:

1. Statistical investigation of the sun spots and of the earthmagnet fields must be considered to be conclusive; no new facts can be added. By the thorough and ingenious methods, with the aid of which the most notable scientis have worked in this direction, the correlation between the two phenomena has be proved unquestionably.

2. Further investigations must be based on other methods by which more deep penetration into the nature of the sun spots as a physical phenomenon are possible. Here the individual examination of the sun spots as well as a de tailed classification of the earthmagnetic disturbances is very important.-- Author's abstract translated by W. Ayvazoglou.

BEITRÄGE ZUR ERDMAGNETISCHEN ERFORSCHUNG NORDDEUTSCHLANDS

(CONTRIBUTIONS TO THE EARTHMAGNETIC INVESTIGATION OF NORTH GERMANY)

By E. Kohl

Jahrbuch der Preussischen Geologischen Landesanstalt zu Berlin,
vol. 49, part 1, 1928, pp. 124-137.

The purpose of earthmagnetic measurements carried out in 1926 in the gion of Salzgitter-Flachstockheim-Oderwald consisted of examining the magnetic fect of iron ores and salt domes in the vicinity of Salzgitter.

The different measurements were united so that a continuous magnetic ofile could be drawn extending over 13 kilometers from the western slope of e Salzgitter mountain chain to the axis of Oderwald.

Schmidt's vertical field balance No. 62964 was used. Forty-nine ations were covered; in most cases three or four measurements were made at every ation so that an accuracy within the limits of ± 5 γ (at some stations the curacy was even ± 0 γ) was reached.

The proceeding of calculations is given in a special numerical table. attempt (shown in the added outline-map) to construct the isanomalies was de, but a complete picture could not be obtained owing to the insufficient mber of stations observed. The results of the investigation are described and mpared with two profiles obtained by P. Krahmann from measurements carried out out 500 and 2,000 meters to the south.--W. Ayvazoglou.

MAGNETIC SUSCEPTIBILITY AND MAGNETITE CONTENT OF SANDS AND SHALES

By D. M. Collingwood

Bulletin of the American Association of Petroleum Geologists,
vol. 14, No. 9, 1930, pp. 1187-1191.

During a study of the relation between small magnetic anomalies of a cal survey and the magnetic susceptibility of the rocks, chiefly sands and ales, comprising the surface outcrop and shallow section, several susceptility determinations of core samples were made. These determinations were rried out in a field laboratory by means of an apparatus consisting of a boratory magnetometer and energized solenoids in which the core specimens were aced. The core samples were classified according to lithology, and the perntage of magnetic minerals (chiefly magnetite) in them was determined. The sceptibility determinations were made in a field of approximately 18 gauss. r this and other possible reasons, they are not considered true in an absolute nse for rocks in place in the earth's field. However, the results, which are ue in a relative sense, show a definite increase of susceptibility with inease of magnetic mineral content, and indicate that the susceptibility inceases from shales through sandy shales and shaly sands to sands.--Author's stract.

MAGNETICS AND GEOLOGY OF YOAST FIELD, BASTROP COUNTY, TEXAS

By D. M. Collingwood

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 9, 1930, pp. 1191-1199.

The relation between the geology of the productive "serpentine" mass and the results of a magnetic vertical intensity survey is illustrated by maps, charts, cross section, and profile.

The writer concludes that the high magnetic anomaly is due to an igneous neck in a major fault plane, up which the igneous rock came as a volcanic submarine extrusion at the close of Austin chalk deposition of the Upper Cretaceous. Other geologic evidence indicates that the faulting which occurred during the succeeding Taylor or Navarro deposition was later increased by post-Wilcox (Eocene) faulting, and he suggests that this earlier faulting occurred mostly in association with the igneous activity.

The writer suggests that the search for such serpentine masses in this region constitutes a special field for magnetics with certain limitations. Inasmuch as plugs or vent fillings generally cause the anomaly, lateral bodies with no vent filling remaining in the channels up which the flow came are probably not indicated. However, where a plug effect is indicated by magnetic anomaly, a productive lateral or domal body of serpentine is found in many places.--Author's abstract.

3. SEISMIC METHODS

ON THE PIEZO-ELECTRIC ACCELEROMETER AND ITS APPLICATION TO THE MEASUREMENT OF THE VELOCITY OF THE ELASTIC WAVES PRODUCED BY ARTIFICIAL DISTURBANCES

By Yosio Kato and Saemontaro Nakamura

Proceedings of the Imperial Academy, Tokyo, vol. 6, No. 7, pp. 272-274.

The problem of introduction of a piezo-electric accelerometer into seismometry (Prince B. Galitzin) was discussed. Such a seismometer was designed by O. Wood, who succeeded in recording the change in potential with an oscillographic galvanometer by adopting the resistance capacity amplification, but introduced a transformer in the output circuit to eliminate the large plate current through the galvanometer circuit. What is recorded by this circuit shows, however, the time rate of the change in acceleration instead of the acceleration itself, which is the information desired. The writers improved this point and obtained very large magnification without any increase of difficulties in adjusting the instrument.

A description of such a piezo-electric accelerometer, as well as its application, is given.--W. Ayvazoglou.

ÜBER DEN VERLAUF KÜNSTLICHER ELASTISCHER BODENWELLEN UND DIE BERECHNUNG DER TIEFEN DER UNSTETIGKEITSFLÄCHEN

(ON THE COURSE OF ARTIFICIAL ELASTIC GROUND-WAVES AND THE CALCULATION OF THE DEPTH OF DISCONTINUOUS STRATA)

By O. Barsch

Jahrbuch der Preussischen Geologischen Landesanstalt, zu Berlin, vol. 49, part 1, 1928, pp. 327-338.

Owing to the uncertainty of the course of the waves on which the calculations are based, there is in the theoretical conclusion a source of error the amount of which depends on the difference in the travel times of the perpendicular wave-rays and those moving with the greatest possible velocities. In this article the author makes calculations on the travel times of the waves moving by these two extreme courses and discusses the possibility of the determination of the resulting source of error by calculation.

The first part of the article deals with the calculation of the travel-times and of the depth of the discontinuous strata, taking into consideration the law of refraction.

Two cases are examined: (1) Strata lying parallel one to another and (2) strata that are not parallel. In the second part the calculation of the depths of the discontinuous strata in case of a perpendicular course of the waves is presented.--W.Ayvazoglou.

INVESTIGATION ON THE DEFORMATION OF THE EARTH'S CRUST IN THE TANGO DISTRICT CONNECTED WITH THE TANGO EARTHQUAKE OF 1927

By Chuji Tsuboi

Bulletin of the Earthquake Research Institute, Tokyo, vol. 8, part 2, 1930, pp. 153-222.

Contents of the article:

1. Introduction.
2. Data of precise levellings.
3. Study of the results of precise levellings.
4. Comparison of the results of triangulations before and after the earthquakes.
5. Study of the results of triangulations.
6. The relation between the vertical displacements and the divergence.
7. Postseismic displacements of secondary triangulation points.
8. Movements along the Gomura and Yamada faults.
9. Concluding remarks.

Geodetic data concerning the deformation of the earth's crust in the Tango district are discussed.

The cause and the mechanism of the occurrence of earthquakes is examined. The writer points out that there is a close correlation between the geographical distribution of gravitational anomalies and that of the epicenters of earthquakes in Japan. The districts most frequented by earthquakes were found to be those in which the gravitational anomalies are remarkably negative. This suggests that the generation of earthquakes, or rather of the "chaos" of blocking movements, is due to some peculiar circumstances of the physical or chemical state of the portion of the earth's crust in the immediate neighborhood of, or right beneath, the earthquake district, but not to any force working from distant places.--W. Ayvazoglou.

PRELIMINARY REPORT ON THE OBSERVATION OF THE TILTING OF THE EARTH'S CRUST WITH A PAIR OF WATER PIPES

By Ryutaro Takahashi

Bulletin of the Earthquake Research Institute, Tokyo, vol. 8, part 2, 1930, pp. 143-152.

The instrument used for observations consists essentially of a pair of pipes which are buried horizontally in the ground perpendicular to each other and half filled with water.

In this article the results of observations made for nearly one year and the description of the pipes and the observing chambers are given. Seven figures illustrate the article.--W. Ayvazoglou.

4. ELECTRICAL METHODS

PROBLEMS OF ELECTRICAL PROSPECTING ON THE GROZNEFT FIELDS (IN RUSSIAN)

By A. Shaiderov

Azerbeidjanskoe Neftianoe Khoziaistvo (Azerbeidjan Petroleum Industry), vol. 10, No. 6, 1930, pp. 58-63.

In speaking of the results of geophysical investigations made on the oil fields in the region of Grozny the author draws the following conclusions: Too-general information, which could be interpreted with great difficulty only, was obtained by the gravimetrical method of prospecting; the seismic method used in this region in the summer of 1929 did not show good possibilities under the existing conditions of work and besides was too slow. The electrical method (Schlumberger) which was used on the Grozny oil fields proved to be sufficiently suitable.

The main question in using geophysical methods of prospecting is that of the amount of the change of parameters of the rocks under investigation. In a lecture delivered by Schlumberger at a meeting of geologists in Moscow in 1929 he gave some information on the amount of the resistance of different

rocks. Thus, if the resistances are measured and drawn on a topographic map the configuration of the layer of the resistance sought for may be shown, and such a map of electrical parameters, interpreted geologically, may disclose the character and the structure of the region.

Schlumberger's method of prospecting was used during the winter of 1929-30 on the areas of the Grozneft, and the structure of the anticline has been determined with great accuracy.

Three figures showing the results of the electrical investigation of synclines and anticlines at different places are given. The author concludes the article by giving a brief description of the regions assigned for electrical investigations in the summer of 1930.--W. Ayvazoglou.

ELECTRICAL METHODS FOR SUBSOIL INVESTIGATION

By Sherwin F. Kelly

Proceedings of the Brooklyn Engineers' Club,
vol. 28, part 3, 1930, pp. 22-41.

The present paper concerns principally the use of a direct electric current passed through the ground for the purpose of studying the resistivities of the underlying geological formations. The author does not go deeply into the theory of electrical exploration but discusses some types of problems which the method can solve. He cites cases where the Schlumberger method has been applied, giving examples and illustrations from more complete accounts of the works published elsewhere of which this paper is a summarization. Reference to them are given in the footnotes. The following examples are mentioned:

1. Discovery of the copper ore body of Tilva Roch (Serbia).
2. Study of concealed, tilted strata at Fierville-La-Compagne, in Normandy, France.
3. Location of the Rhine fault near Lobsann (Alsace).
4. Study of the May syncline (Normandy).
5. Exploration for lignite in Landes.
6. Study on the Hettenschlag salt dome in Alsace.
7. Examples showing the electrical predictions and the true depths determined by drilling, in a survey of two dam sites located on the Connecticut River near Littleton, N. H.

Seventeen figures illustrate the article.--W. Ayvazoglou.

ELECTRICAL PROSPECTING FOR OIL STRUCTURE

By Karl Sundberg

Bulletin of the American Association of Petroleum Geologists,
vol. 14, No. 9, 1930, pp. 1145-1165.

Electrical prospecting methods were originally developed for the purpose of finding ore. Only recently have electrical methods been applied to oil prospecting. Some investigators assert that oil can be located directly as an

insulator by electrical methods, but this is believed to be possible only under extremely favorable conditions, which occur in very few places.

Both potential and electromagnetic methods have recently been applied to structureal studies. Electromagnetic methods, so far as developed at present are believed to have broader applicability because of greater depth penetration.

The Swedish electrical methods for structural studies are described and the possible applications discussed. The conclusion is that these methods have broad application and that they are particularly suitable for detail work, especially in faulted regions.

Results of electrical surveys in the salt-dome district of Texas and Louisiana, the Balcones fault zone in central Texas, and the West Texas Permian basin are presented and are compared with results of drilling. Most of the electrical pictures agree well with the geological ones.

A party of two or three engineers and 12 or 15 helpers can survey an area of 1 to 6 square kilometers a day. The depth reached generally ranges from 500 to 1,500 feet.--Author's abstract.

GEOELECTRIC INVESTIGATIONS OF NONCONDUCTORS -- FOUR NEW EXAMPLES

By Norbert Gella

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 9, 1930, pp. 1165-1177.

This article is a theoretical and practical explanation of the application of geoelectric methods in oil fields.

If favorable subsurface conditions exist, valuable results can be obtained by using several methods in combination. Close cooperation with the geologist is of utmost importance.

For examples of practical, successful work in oil fields of Germany, Poland, and Rumania are given.--Author's abstract.

ELECTRICAL SURVEY OF STRUCTURAL CONDITIONS IN SALT FLAT FIELD, CALDWELL COUNTY, TEXAS

By Helmer Hedstrom

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 9, 1930, pp. 1177-1187.

The writer points out the difficulties in mapping the oil structure of the Balcones fault zone in Texas in the usual way, by a study of surface geology. Core drilling has been used in many places, but has not proved very successful on account of the uncertainty involved in identifying the beds and in correlating them between holes.

A discussion of the application, in this area, of the Sundberg electromagnetic method of mapping structure describes the basic principles and shows the method to be much superior to core drilling in speed and efficiency.

The survey made by the Sundberg method in the Salt Flat, or Bruner, oil field was begun in October, 1928, when only the discovery well was productive and before the trend of the producing fault structure was known. The fault was mapped electrically by one surveying crew in about a month, and the later development of the field has proved the results correct, as shown by the map.

A comparison of these electrical results with the data obtained from later drilling gave excellent agreement, as shown by five different profiles across the field.--Author's abstract.

ELECTRIC AND ELECTROMAGNETIC PROSPECTING FOR OIL

By W. P. Jenny

Bulletin of the American Association of Petroleum Geologists,
vol. 14, No. 9, 1930, pp. 1199-1215.

General geologic problems of electric oil prospecting are discussed and the main theories for electric and electromagnetic oil prospecting developed.

According to practical experience, the average depth reached by electric surveys is less than 600 feet.

Interpretations based on simple assumptions ordinarily approach the actual geologic conditions more closely than interpretations based on complicated theories.--Author's abstract.

5. RADIOACTIVE METHODS

THE GEIGER TUBE ELECTRON COUNTER

By L. F. Curtiss

Bureau of Standards Journal of Research
vol. 5, No. 1, 1930, pp. 115-125.

Experiments are discussed which show that the sensitive surface of the Geiger tube counter is not on the wire electrode, but on the inner surface of the tube. This result explains the previously observed result (see Geophys. Abs. No. 15) that the operation of the counter is only slightly affected by the condition of the surface of the wire electrode. An explanation of the operation of the counter is offered which takes account of this additional information.

Contents: (1) Introduction; (2) Recent experiments on the location of the sensitive surface; (3) Discussion of operation of counter.--Author's abstract.

6. GEOTHERMAL METHODS

DER TEMPERATURVERLAUF IM SANDBODEN

(THE COURSE OF THE TEMPERATURE IN SANDY SOIL)

By R. Süring

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 285-291

In this article the author gives some information on the diurnal course of the temperature in the upper strata, as well as on the yearly temperature distribution at greater depths. The question is discussed under the following headings: (1) The diurnal temperature exchange between the surface of the earth and the depth of 1 meter; (2) The yearly course of the temperature down to 12 meters of depth; (3) Temperature variations at greater depths.

In his résumé the author says:

> In representing the diurnal course of the temperature in the upper strata of an almost homogeneous sandy soil it is proved that the distribution of the heat is not as uniform as could be expected. In connection with this the author points out that the vertical temperature gradient in the soil shows several changes during the greatest part of the year, these changes must probably be attributed partly to the distribution of the underground waters and partly to the after-effects of greater air anomalies occurring in the deep strata.--W. Ayvazoglou.

GEOTHERMAL PROSPECTING (IN RUSSIAN)

By V. I. Belov

Wissenschaftliche Abhandlungen des Loretz-Berginstituts Namens Artem in Stalin, vol. 4, 1929, pp.95-102.

The author notices the usefulness of geothermal prospecting for the geologist and derives mathematical formulas for the calculation of geothermal gradients, law for the change of the temperature based on different factors and various indirect influences.

He concludes that the essential point of the geothermal prospecting consists of measuring the temperatures and the determination of distances from factors influencing the change of the temperatures. The factors by which the temperature anomalies are caused are enumerated.--W. Ayvazoglou.

7. UNCLASSIFIED METHODS

REVIEW OF GEOPHYSICAL PROSPECTING FOR PETROLEUM, 1929

By Donald C. Barton

Bulletin of the American Association of Petroleum Geologists,
vol. 14, No. 9, 1930, pp. 1105-1129.

The campaign of geophysical exploration continued without abatement in the Gulf Coast region during 1929. Thirty-five prospective salt domes were discovered during the year. Six commercial oil fields were discovered in the Gulf Coast region, and one, Van, in northeast Texas, on geophysically discovered salt domes or structures. The torsion balance was restored to favor for reconnaissance for (deep) salt domes, and by the end of the year about 30 torsion balances were working in the Gulf Coast region. In the United States, outside of the Gulf Coast salt-dome area, the seismic, torsion-balance methods, to a less extent the magnetometer, and to a very much less extent the electric method, continued in moderate or sporadic use in Texas, Louisiana, Mississippi, Arkansas, Oklahoma, Kansas, Colorado, New Mexico, California, and Michigan.

In foreign countries considerable use of geophysical methods continued in Mexico, Venezuela, and Roumania, and there was some use of them in many other countries.--Author's abstract.

GEOPHYSICAL PROSPECTING FOR MINERALS

By Arnaldo Zabelli

Queensland Government Mining Journal,
vol. 31, No. 361, pp. 256-258.

In this article (originally published in Mineraria Italiana) the author discusses what possibilities might arise if, on the basis of the numerous data which the United States Bureau of Mines collects and publishes on the geophysical explorations effected in the United States and abroad, the Bureau of Mines could accomplish the following tasks: (1) Scientifically to establish if, and to what extent, there really exist appreciable links (such, that is, as can be measured) between the physical properties (electrical, electromagnetic, electrochemical, seismic, radioactive, thermic) of the useful minerals in the subsoil and measuring instruments placed above the soil. (2) To define the real industrial range of the employment of the various geophysical methods and thus to fix their proper place in mining economy. (3) To deduce from the two affirmative presuppositions the best line to be followed in further speculation, both theoretical and experimental, in order to approach ever more rapidly toward the realization foreseen by Leonardo da Vinci when he predicted that the "hidden treasures and gems in the womb of the earth shall all be manifest." (4) Finally, to study the best means of eliminating that outcrop of improvisation which, vaunting marvelous specialties, and finding a particularly fruitful field of action, speculates on the confidence engendered by success, and thus does serious harm to the mining industry, and delays still more the already slow progress of geophysics.

Examples are given supporting the necessity of the realization of Zabelli's propositions.--W. Ayvazoglou.

CHOICE OF GEOPHYSICAL METHODS

By Frank Rieber

Mining and Metallurgy, vol. 11, No. 282, 1930, pp. 301-305.

In this article the author discusses the selection of a geophysical method applicable to prospecting for oil or for other minerals. Rieber examines especially the problem of checking the rising cost of the discovery of new fields (particularly on the Pacific coast) by the proper employment of geophysical methods.

Different methods are examined and the importance of the interpretation of the results for the choice of the most suitable one is mentioned. The author says:

> In the development and adaptation of geophysical methods, there are several things to be considered by everyone concerned. First, a criticism of the geophysicist: The natural tendency is to take every possible measure to obtain work. There is a great temptation to claim too much for a method, to overstate what can be hoped from it, particularly if everyone else is doing the same thing. Nine figures illustrate the article.--W. Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN VOL. 1, NO. 8-9, OF THE "BOLETIN DE LA ASOCIATION GEOFISICA DE MEXICO"

Boletin de la Asociation Geofisica de Mexico, vol. 1, No. 8-9, 1930, pp. 127-153.

1. Radioactivity a topic of to-day's geophysics. This is the first part of a lecture delivered by Prof. Juan Korzujin in the Geophysical Association of Mexico in February, 1930 (an abstract will be published after the conclusion of the article).

2. Method for measuring the susceptibility of rocks, by J. G. Koenigsberger (see Geophys. Abs. No. 9, p. 18).

3. Physical principles of the gravimetric method of prospecting, by P. Nikiforov. Continuation of the Russian article, translated into Spanish by Prof. Juan Korzujin (see Geophys. Abs. No. 16, p. 16).

4. Geophysical methods of prospecting, by Georges A. Boutry. Continuation of the French article, translated into Spanish by L. Urguijo, Eng. (see Geophys. Abs. No. 16, p. 16).--W. Ayvazoglou.

ERFAHRUNGEN MIT GEOPHYSIKALISCHEN METHODEN IN SÜDAFRIKA

(EXPERIENCE WITH GEOPHYSICAL METHODS OF PROSPECTING IN SOUTH AFRICA)

By H. Reich

Metall und Erz., vol. 27, No. 11, 1930, pp. 287-291.

The author reports on the results of geophysical prospecting work in outh Africa, especially in the copper districts, and shows how, by means of ough measurements of electric resistances (under natural conditions) and magetic susceptibilities (on samples), the possibility of application of geophysical methods in real cases can be estimated. The author is of the opinion that he failures of electrical prospecting conducted so far in the copper deposit reas in "Klein-Namaqua-land near Okiep and Kobabeep" can be explained by limatic conditions of the region. The dry climate causes an extreme dryness f the upper strata of the soil and a saturation of subterranean waters with alts. Fissures and layers saturated with these waters may easily make the btained indications obscure. In addition to this the electrical resistances f the local porous rocks in case of absolute dryness and even small humidity re very different. The structure of the rocks is not favorable for electrial prospecting either.

The author finds that the magnetic method can be used here with adantage for limiting the ore areas; after this the electrical prospecting may e used with greater success as the interpretation of the data becomes easier.

Very successful were the results of the electrical methods of prosecting in the Si district in North Rhodesia at the border of the Belgian ongo.

Investigations made by the author show that the electrical methods an not be used for prospecting sedimentary ores of Katanga types (eingesprengte xydierte" Erze) but good results may be expected for prospecting sulphide odies in the Broken Hill (North Rhodesia) dolomite deposits. Very promising s the prospecting for titanium-magnetite deposits near Pretoria and the hromite deposits of Great Dyke.

Selukwe chromites are characterized by small magnetic susceptibility nd are bad electric conductors.

Concerning geophysical prospecting for gold the author is of the opinon that under the existing conditions (conglomerates) the electrical method an not be used; the application of this method for gold veins of the South hodesia type with large concentration of sulphide minerals is possible but ere also the picture may be obscured by the proximity of graphitic slates and et rocks so that practically the electrical prospecting will become difficult.

The determination of the famous "pipes" with which the primary diaond deposits are connected is, according to the author, possible by using the lectrical as well as the magnetic method. Crystalline slates of the deep nderground and the superficial sedimentary covers are not as good conductors

as the blue iron earth (Blaugrund) and are of smaller susceptibility. Practically the geophysical determination of "pipes" does not promise much success because owing to comparatively small difference in physical properties (requiring very accurate measurements and large surfaces of these "pipes") and complexity of geological structure, the results of the measurements may be obscured. The author is of the opinion that the idea of magnetic prospecting for diamond placers, discussed recently in the South African mining literature, can absolutely not be realized. Prospecting for gold placers is possible in case they are connected with large accumulations of magnetite (U. S. A., Heiland).

The method can not be applied for diamond placers of South Africa owing to the fact that their content of magnetite is absolutely insufficient for producing the necessary effect. Besides the magnetite content can not serve as an indication of a diamond deposit.

The author draws the conclusion that the general aspect for application of geophysical methods of prospecting in South Africa in the regions of the ancient "Continentalsockel" is not very promising. On the other hand, in the regions covered with new formations the application of the geophysical methods in connection with drilling is the sole means for the study and penetration into the deep strata.--V. Gorsky.

"UBER EINIGE METEOROLOGISCHE BEGRIFFE

(CONCERNING SOME METEOROLOGICAL CONCEPTIONS)

By Otto Tetens

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 297-310.

Different meteorologic moisture-conceptions are classified. Poisson's law is proved to be valid at adiabatic changes of state for the whole period of dryness. Owing to the fact that there are only a few aerological places of investigation and their work is uncertain it is important that the paths of the state be inserted between two corresponding places of adjacent ascents.

Formulas and drawings, taking into consideration the entropy, content of water vapor, and density of the air, are given.--Author's abstract translated by W. Ayvazoglou.

"UBER DIE FEINSTRUKTUR DES TEMPERATURGRADIENTEN "LANGS BERGHÄNGEN

(ON THE ACCURATE MEASUREMENT OF THE TEMPERATURE GRADIENT ALONG MOUNTAIN SLOPES)

By A. Wagner

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 310-318.

Wagner describes the investigations carried out in connection with meteorological peculiarities in mountainous regions. Five meteorological stations provided with recording instruments were established at different

ltitudes near Innsbruck. The records obtained during the period of over one ear served as the basis for the investigation.

In this article the author describes briefly several measurement trips, he purpose of which was to establish the temperature gradient along the moun- ain slopes and its dependence on the time of the day, season, and weather con- itions. The author succeeded in assembling an instrument by means of which, ring to the possibility of its almost instantaneous adjustment, a reliable eading could be obtained from the moving cabin.

A descri tion of the electrical resistance thermometer provided with entilation used during the trips and a schematic design of it are given. igures are added showing (1) the temperature distribution along the slope of nnsbruck-Hafelekar on April 2, 1930, (2) the longitudinal profile Innsbruck- afelekar and (3) the temperature distribution on November 23, 1929.

Characteristic details of temperature variations and temperature dis- urbances along the mountain slope are discussed.

Two experimental ascents in airplanes have proved the full fitness of his electrical measurement method; the readings from the needle galvanometer ould be made with great accuracy.--W. Ayvazoglou.

DAS UNPERIODISCHE ELEMENT IM TROPENKLIMA

(THE APERIODIC ELEMENT IN THE TROPICAL CLIMATE)

By K. Knoch

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 318-329.

In addition to the very irregular weather conditions in tropical cli- ates there are also characteristic atmospherical changes which are called the eperiodic element in the tropical climate." These changes have not been given correct estimation so far. They may appear in the form of variations in early distribution of precipitations, of heavy showers in areas usually lacking n rain, of aperiodic temperature changes, cold winds, pressure variations, and f storms. Corresponding examples are mentioned. Without taking into consider- tion the changes in the yearly distribution of precipitation, which are brought nto connection with the displacements of the great wind zone of the earth, in ost other cases the reason might consist of the movement of air-masses from igher latitudes to the tropics. Therefore the conclusion is drawn that the eperiodic element in a tropical climate may be explained by the interdependence f the tropic zone, and the climate zones of higher latitudes.--Author's abstract ranslated by W. Ayvazoglou.

NECESSITY OF URGING PROSPECTING FOR NEW OIL DEPOSITS (IN RUSSIAN)

By B. Numerov

Za Neftianuiu Piatiletka (For the five-year program in the oil industry), vol. 1, No. 6-7, 1930, pp. 6-7.

In this article Numerov expresses his opinion on the geophysical ethods of prospecting, especially magnetic and gravimetrical, based on

information obtained by him during his recent visit to the United States. The importance of general magnetic and gravimetric surveys of large areas is noticed. An aerial survey which can be substituted for the usual topographic survey is recommended owing to its low cost and quick work (from 50 cents to $1 per square kilometer; 1,000 square kilometers can be surveyed during one day).

He says: "Prospection of oil-bearing deposits in the U. S. S. R. can be carried out more quickly if the simple method of aerial survey is used."--W. Ayvazoglou.

THE SWAN WELL

Michigan Well Driller, January, 1930, pp. 3, 5, and 9.

In the Michigan Well Driller for January, 1930, pp. 3, 5, and 9, there is an interesting history of the Swan well, including the results of a series of measurements to determine the depths at which the main flows of water were entering. The best result was obtained by using a current meter lowered by heavy electric cable, and the variation of velocities of the current meter showed very distinctly the points where flows entered.--Alfred C. Lane.

9. NEW BOOKS

Comptes Rendus du II. Congres International de Forages (Second International Drilling Congress, Paris, September 16-23, 1929). These proceeding form a work of 718 pages divided into several chapters: (1) Organization of the congress, a general list of delegates, program of the congress, entertainments, and excursions; (2) technical papers. The papers, 67 in number, are supplemented by discussions. They include 19 reports on geology and stratigraphy; 10 reports on geophysical methods of prospecting; 18 on drilling technique and related subjects; 5 on drilling application; 13 on economics and statistics of drilling and recording of results; and 2 on drilling laws. Orders taken by the Secretary of the Congress, 85 Boulevard de Montparnasse, Paris (6e). 2 volumes, 718 pp. Price, 100 francs.

Krejci, Karl. Grundfragen der Oelgeologie (Basic Questions of Oil Geology). Verlag von Ferdinand Enke, Stuttgart, 1930. 182 pp., 7 figs., price 20 mark. Eleven chapters (chapter 9 deals with geothermic problems).

Marr, J. E. Deposition of the sedimentary rocks. Cambridge University Press, 1929; The MacMillan Co., New York, 5 by 7-1/2 inches, 245 pp. Price, $2.40 (7 s. 6d.).

Webel, A. A German-English Technical and Scientific Dictionary. Routledge and Sons, Ltd., Broadway House, Carter Lane, E. C., London, Price 36 s. net.

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GEOPHYSICAL ABSTRACTS[1]

No. 19

Compiled by Frederick W. Lee[2]

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2 - Senior physicist, U.S. Bureau of Mines.

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1. GRAVITATIONAL METHODS

UEBER DIE ABHÄNGIGKEIT DER SCHWERKRAFT VON ZWISCHENMEDIUM

(THE DEPENDENCE OF THE GRAVITATIONAL EFFECT FROM THE INTERMEDIATE LAYERS)

By Teodor Schlomka

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 392-396.

In a previous article (see Geophys. Abs. No. 2, 1929, p. 13) the author reported briefly on his experiment, the purpose of which was to establish whether there is a dependence of the gravitational effect from an intermediate layer upon the "refraction of the gravitational lines of forces" (Kraftlinienbrechung).

In this article Schlomka proves by experiments that the results on this dependence were not influenced by disturbing magnetic forces, and according to his statement the data obtained from torsion-balance measurements were not influenced by the different external magnetic fields. Changes in magnetic fields, even 60 times stronger than the earthmagnetic field, did not cause any disturbing influence upon the results of the measurements.--W. Ayvazoglou.

ON THE EXPANSION OF THE EARTH'S GRAVITY IN POWERS OF THE SQUARE OF THE SINE OF THE LATITUDE

By Corradino Mineo

The Quarterly Journal of Mathematics (Oxford Series), vol. 1, No. 2, June, 1930.

Assuming that the surface of equilibrium of the earth is an oblate spheroid of revolution, with equatorial radius a and ellipticity e, this paper derives the relation:

$$\frac{g}{g_e} = 1 + \left(\frac{5}{2} m - \frac{1}{2} e^2 - \frac{13}{7} m e^2 \right) \sin^2 \varphi + \left(\frac{5}{4} m e^2 - \frac{1}{8} e^4 \right) \sin^4 \varphi$$

where $m = w^2 a \mid g_e$

w is the angular velocity of the earth,

g_e is the value of gravity on the surface at the equator,

g is the value of gravity on the surface at the latitude φ.

For details, the original paper should be consulted.--Irwin Roman.

2. MAGNETIC METHODS

PRACTICAL GEOMAGNETIC EXPLORATION WITH THE HOTCHKISS SUPERDIP

By Noel H. Stearn

The American Institute of Mining and Metallurgical Engineers,
Technical Publication 370, 1930, 31 pp.

Contents of the article:

1. History. - The Hotchkiss Superdip magnetometer has been evolved as a result of an attempt to carry over into the field of magnetic exploration of anomalies of low magnitude the outstanding advantages of speed and simplicity which are inherent in the ordinary dip needle.

2. Working Principles. - A description and a diagram of working principles of an ordinary dip needle and Hotchkiss Superdip are given.

3. Construction. - A photograph showing the construction and mounting of the Hotchkiss Superdip, as well as a brief description of it, is included. From the specifications given in a table an idea of the bulk and weight of the apparatus can be drawn.

4. Behavior. - The action of the device is illustrated by figures showing (a) the setting of the Hotchkiss Superdip; (b) a typical graph of the instrument behavior throughout its principal working range of sensitivity, and (c) a graph of the practical working sensitivity of a typical instrument, together with the average sensitivity of 14 ordinary dip needles.

5. Field Procedure. - Because a geomagnetic survey is merely a supplement to a geological survey, the field procedure must necessarily depend upon the geological problem to be solved and upon individual ingenuity. A figure shows a typical page of data recorded on a special form designed to offer a concise and complete system of notation.

6. Corrections. - To secure results of maximum precision six different corrections may be applied to the readings. The corrections are for (1) temperature, (2) diurnal variation, (3) day-to-day variation, (4) latitude, (5) longitude, and (6) correction to base. Diagrams showing typical correction curves, combined latitude and longitude correction, and magnetic profiles showing influence of various corrections are given.

7. Application. - Nine cases are cited where the Superdip has been applied in seven different States (Wisconsin, Minnesota, Texas, Oklahoma, Kansas, Arizona, and Arkansas) in connection with geomagnetic methods of exploration for eight different natural resources (copper, iron, oil, gas, lead, gold, bauxite, and diamonds).

In conclusion the author says:

The foregoing examples of the application of the geomagnetic method to exploration by the use of the Hotchkiss Superdip are far from exhaustive even of the types of problems to which the method and the instrument may be applied. Nor is the implication intended that similar results may not be obtainable with other instruments. In categorizing the Superdip, however, it should be borne in mind that the instrument has been designed as a facile tool for the use of mining engineers and economic geologists, and that its use is recommended for magnetic anomalies of an order of magnitude greater than 10 gammas.--W. Ayvazoglou.

GEOMAGNETIC INVESTIGATION OF ALGONKIAN CONTACT DEPOSITS AND GRANITES IN PRIBRAME (IN BOHEMIAN)

By Fr. Čechura

Rozpravy II. Tridy Ceské Akademie, vol. 39, No. 10, 1929, 14 pp.

Contents:

1. Introduction.

2. Topography.

3. Magnetic survey.

4. Interpretation of the data obtained.

5. Results.

A table summarizing the data and two maps are added.--W. Ayvazoglou.

UEBER DIE MAGNETISCHE STÖRWIRKUNG VON EISENKÖRPERN UND EISENMASSEN (SCHACHTANLAGEN, BOHREINRICHTUNGEN, USW.)

(ON THE MAGNETIC DISTURBANCE-EFFECT OF IRON BODIES AND IRON MASSES SUCH AS SHAFT INSTALLATIONS, DRILLING ARRANGEMENTS, ETC.)

By E. Kohl

Kali und verwandte Salze, vol. 24, Nos. 12, 13, and 14, 1930, pp. 177-181, 93-120, and 212-216.

During the earthmagnetic investigation between the mountain range Salzgitterer and the Oderwaldsattel a strong negative disturbance of the vertical intensity was established above the Flachstöckheimer salt dome. This disturbance could not be assigned exclusively to the influence of salt, thus its explanation caused some difficulties.

In connection with the solution of this problem the author carried ut a number of magnetic observations upon iron bodies of different kinds and ives in this article the results of his work.

Observations on the following bodies were made:

1. Simple bodies: (a) Pipes in perpendicular position and single oreholes; (b) horizontal pipes.

2. Combined bodies: (a) Shaft installations, groups of boreholes and nstallations for working of oil; (b) vehicles of all kinds.

The results of observations are summed up as follows:

The character of disturbance of iron and steel bodies, simple and ombined, magnetized by earth induction is, of course, a positive one. But hese bodies cause not only a positive disturbance of the vertical intensity ut in all cases also a negative one. The relation of these two disturbances, ith regard to their order and their mutual position, is different according o the form of the disturbing body and its position in regard to the earth ield.

The distance of the disturbance-effect, measured on the surface of the round, changes with the mass, form, and position of the body.

How far from a disturbance body shall the observer stay during the arthmagnetic investigations in order to avoid errors in the results of measure- ents depends not only on the distance of the disturbance effect of this body ut also on the accuracy of measurements desired.

A series of figures and a table showing the data of observations is dded.--W. Ayvazoglou.

EIN UNIVERSAL INDUKTIONS MAGNETOMETER

(A UNIVERSAL INDUCTION MAGNETOMETER)

By W. Uljanin

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 435-442.

This article deals with the construction of an induction magnetometer y the aid of which all the three elements of the earth's magnetism can be etermined.

The following items are given:

1. The description of the instrument (a photograph is added).

2. The use of the instrument (schematical design for the measurement f intensity is given).

3. Examination of the instrument.

4. Measurements with the instrument.

5. The projected induction magnetometer.

In conclusion the author discusses the question on the application of the induction magnetometer.--W. Ayvazoglou.

CONSTRUCTION OF MAGNETIC CHARTS

By W. N. McFarland

Terrestrial Magnetism and Atmospheric Electricity,
vol. 35, No. 2, 1930, pp. 73-80.

This article is a review of the methods which have been used by the United States Coast and Geodetic Survey in the construction of the isomagnetic charts which it has published, with comment on the adaptibility of the different methods.--Author's abstract.

A COMPARISON OF MAGNETIC DISTURBANCE AT DIFFERENT STATIONS

By W. F. Wallis

Terrestrial Magnetism and Atmospheric Electricity,
vol. 35, No. 2, 1930, pp. 93-101.

A brief discussion of the magnetic records obtained during the MacMillan Baffin Island Expedition of 1921-22 is given with comparison of results from several other well-disturbed observations. For comparison a short, well-defined, world-wide magnetic storm (March 14, 1922) was selected, and departures from normal values were compiled and compared by three methods: (1) Difference between the disturbed and normal total-intensity vectors; (2) excess energy of the magnetic field due to the disturbance; and (3) magnetic activity proposed by Chree, using absolute daily ranges in three rectangular components of the total magnetic intensity. It is concluded that the geographic distribution of magnetic activity during disturbance bears a close relation to the auroral zone, and there is evidence that the zone of maximum auroral frequency is also a zone of maximum magnetic activity. If we take average values of the disturbance-vectors over several months, there is a marked regularity in their directions for the individual stations, and for all stations the general direction of the horizontal-intensity disturbance-vectors is southward. This indicates that the disturbing currents in the upper atmosphere flow in general from east to west around the earth.--Author's abstract.

MAGNETOMETER RESULTS IN LEA COUNTY, NEW MEXICO

By L. Spraragen

The Oil and Gas Journal, vol. 29, Nos. 4 and 6, 1930, pp. 91-92 and 34 and 92-94.

The object of this paper is to show the magnetometer results of measurements carried over into Gaines and Andrews Counties, Tex. From this work the relation of the magnetometer structures in these two counties can be studied with respect to the structures in New Mexico. Six profiles are shown, together with the locations of the stations. A discussion of the profiles is given.

In conclusion the author expresses the opinion that the fact that the magnetometer results are so pronounced and the relief so great should perhaps create additional confidence in the value of the magnetometer for certain areas, providing, of course, that such relief is in some way connected with the geology for that area.--W. Ayvazoglou.

3. SEISMIC METHODS

UEBER DIE FORM DER FERNSCHALLWELLE

(ON THE FORM OF DISTANT SOUND WAVE)

By W. Kühl

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 358-361.

The remarkable changes of form which sound waves produced by explosion undergo in the atmosphere have not been considered sufficiently. The form of the wave was examined mostly from the viewpoint of technics of explosion, and the observations were made close to the place of explosion. The great variety wave forms at a certain distance resulted, of course, in their being classified empirically into certain types, but only a few attempts were made to explain and utilize these types. The reason for neglecting this problem was mainly that the form of the waves reproduced in the receiving instruments was generally thought to be too distorted to allow the reduction of curves to the true course of pressure.

In this article the author shows that, although imperfect, the registration of the receiving instruments now in use is sufficiently good for making the necessary conclusions on the form of waves. Several examples of typical and remarkable distant sound wave curves are reproduced and discussed.--W. Ayvazoglou.

A PROPOSED ACCELEROMETER FOR USE IN A SEISMIC REGION

By Frank Wenner

Eastern Section of the Seismological Society of America,
Proceeding of the 1930 Meeting, Washington, D. C., pp. 46-51.

The author describes the construction of an instrument from which the earth movements can be determined to the precision required in engineering calculations:

a. A steady mass consisting essentially of a rectangular loop of copper wire approximately 1 centimeter wide and 3 centimeters long, and having a mass of about 1 gram.

b. Supports for the steady mass of the torsion type in line with one of the longer sides of the rectangle and of such stiffness as to give a period of 0.1 second.

c. Damping by means of a cobalt steel magnet so located that movement of the steady mass or rectangle with respect to the support results in an electric current in the loop.

d. Photographic registration, using a mirror located near the axis of the moving system and photographic paper at a distance of 50 centimeters fr the mirror. The timing clock and photographic paper to be started in motion and the lamp turned on by an acceleration in excess of some selected magnitude. such for example as 0.03 gravity.

The added figures show: (1) For different degree of damping, the manner in which the displacement shown on the record approaches its final magnitude in case of a suddenly applied acceleration of 0.04 gravity; (2) in case of 0.625 critical damping, the way in which the amplitude of the displacement shown on the record depends upon the period of the earth movement, assuming a harmonic acceleration having an amplitude of 0.04 gravity; and (3) the log of the displacement. Based on the figures given in the article the author is of the opinion that an instrument of the type described (if the damping is in the neighborhood of 0.625 critical) would not only be suitable for the purpose mentioned above but would give directly the accelerations, which are what the engineer most desires to know; these accelerations would be recorded with sufficient accuracy so that both the velocities and the displacements could be determined from them with fair accuracy.--W. Ayvazoglou.

A SERVICEABLE SCALE FOR EARTHQUAKE INTENSITY

By Alexander McAdie

Eastern Section of the Seismological Society of America,
Proceedings of the 1930 Meeting, Washington, D. C., pp. 54-56.

In discussing the question concerning the estimation of earthquake intensity, the author says that while it is fully recognized that objection can

e made to the employment of acceleration at any given point as a basis for stimating earthquake intensity, in view of the fact that no other quasi scientific scale has been suggested, he offers the following:

First, to prepare a decimal scale, the minimum value 1 representing n acceleration of 1 millimeter per second per second, and the maximum 10 an cceleration of 10,000 millimeters per second per second, which, with a little queezing, is practically the acceleration of gravity at sea level in latitude 5°. If the new dynamic meter is used, the scale fits nicely. The scale is n accord with c.g.s. units, a great gain, and international in character.

The author suggests coining the word kilogal to represent the extreme cceleration in a catastrophic earthquake, the prefix kilo meaning one thousand, nd the second syllable being the first letters of Galileo; in the same way the ord milligal can be used for the feeblest acceleration, the range being one illion units of acceleration.

Proposed scale for earthquake-intensity

(Compare with Mercalli-Cancani intensity scale)

Intensity	Description	Acceleration	
		Milligals	Mm. per sec.^{2}
1	Earthquake detectible only by instruments	1 to 5	0.01 to 0.05
2	Very feeble	5 to 10	0.05 to 0.10
3	Feeble	10 to 50	0.1 to 0.5
4	Noticeable but no damage	50 to 100	0.5 to 1.0
5	Felt generally	100 to 500	1 to 5
6	Slight damage	500 to 1,000	5 to 10
7	Walls cracked	1,000 to 10,000	10 to 100
8	Badly built houses destroyed	10,000 to 50,000	100 to 500
9	Violent; much destruction and loss of life	50,000 to 100,000	500 to 1,000
10	Catastrophic	100,000 to 1,000,000	1,000 to 10,000

W. Ayvazoglou.

A TABLE OF TRAVEL TIMES FOR NEAR EARTHQUAKES

By J. S. Joliat

Eastern Section of the Seismological Society of America, Proceedings of the 1930 Meeting, Washington, D. C., pp. 56-59.

The author draws attention to the well-known fact among seismologists hat there is a striking difference between the seismograms of the same earthquake as recorded at nearer and more distant stations, and points out some other nomalies in the near earthquake record which make its interpretation difficult.

Means for elucidation of this problem are discussed.--W. Ayvazoglou.

SOME CHARACTERISTICS OF RAYLEIGH-WAVE RECORDS ON SEISMOGRAMS OF DISTANT EARTHQUAKES

By L. Don Leet

Eastern Section of the Seismological Society of America, Proceedings of the 1930 Meeting, Washington, D. C., p. 60.

An abstract of L. Don Leet's article, communicated by E. A. Hodgson, is given; it is expected that the complete paper will appear in a publication of the Dominion Observatory, Ottawa, Canada.

The abstract reads as follows:

In the course of an investigation of surface-wave records recently completed by the writer at the Dominion Observatory, Ottawa, several characteristics of Rayleigh-wave records were studied.

Satisfactory evidence was not found of the existence of types of induced surface-waves other than the previously known Q, or transverse, and Rayleigh waves, though specific search was made for some of the complex forms shown by Uller to be mathematically possible.

The path of the earth particle during the passage of Rayleigh waves was found to be that required by the theory of Rayleigh--an ellipse traversed in a retrograde sense as regards the direction of propagation of the disturbance.

Evidence was found that in general the "maxima," or "M" portions, so-called, owe their character to fortuitous fluctuations in the phase, period, and amplitude of transverse and longitudinal motions which combine to cause them. As a result, unless a station is equipped with a vertical seismograph, its records do not give a reliable indication of the onset, duration or character of Rayleigh waves, for quakes which are not "end-on" with respect to the instrument's orientation. This would suggest that the reading of "M" for the bulletins of seismograph stations is meaningless.

No inherent identity was found between the surface phases of quakes from a given region, or difference between those of comparable distances from different epicentral regions. It is believed that many apparently unique characteristics are for the most part functions of the azimuth of the quake from the recording station, coupled with the orientation of the instruments.

It is suggested, as a result of this study, that recording stations, to render optimum service, should orient at least some of their instruments with reference to one or more epicentral regions from which most of its records are obtained, rather than in the traditional NS - EW planes.--E. A. Hodgson.

A TILT-COMPENSATION SEISMOMETER

By H. E. McComb

Eastern Section of the Seismological Society of America,
Proceedings of the 1930 Meeting, Washington, D. C., pp. 60-63.

The need of a seismometer of moderate magnification (100 or less) is onsidered, which would record practically all of the major quakes, would not e put out of commission by the light local disturbances, and would be prac-ically free from the effects due to slow tilt. The author used the simplest ethod for making tes' of such a seismometer by applying to existing equipment modification of a compensation-device used by Dr. Romberg at the University f Hawaii. Accordingly, a 10-kilogram Bosch-Omori horizontal pendulum was odified for photographic registration and tilt-compensation. No changes were ade in the column, upper or lower supports, pivots, boom, or steady mass. he balance of the instrument was entirely rebuilt.

The arrangement for obtaining the desired magnification is described nd given in a figure. Figures showing (1) the decay-curve made by tilt-com-ensation seismometer; (2) record of rapid oscillations made by tilt-compensation eismometer; (3) record by tilt-compensation seismometer, October 1, 1929, show-ng damping test and microseisms and (4) plan for mounting two horizontal-omponent seismometers accompany the description.--W. Ayvazoglou.

INSTALLATION OF NEW SEISMOGRAPHS AT THE MANILA OBSERVATORY

By W. C. Repetti

Eastern Section of the Seismological Society of America,
Proceedings of the 1930 Meeting, Washington, D. C., pp. 63-65.

The installation of a set of Galitzin-Wilip seismographs at the anila Observatory, Philippine Islands, is described.--W. Ayvazoglou.

THE EARTHQUAKE, A JOINT PROBLEM OF THE SEISMOLOGIST AND ENGINEER

By N. H. Heck

Eastern Section of the Seismological Society of America,
Proceedings of the 1930 Meeting, Washington, D. C., pp. 42-46.

In this article the author discusses the interrelation of the work f the seismologist and engineer. In conclusion he says:

"I see the earthquake problem as one great problem the parts of which are all interrelated. Some portions of the problem seem far removed to others, but I think that the greatest progress will be made if we fix certain broad aims. As I see them they include:

1. Knowledge of earthquakes, place of occurrence, frequency and intensity--accurate information of this sort is fundamental.

2. Cause of earthquakes--this includes combination of observational data and theory, the observational data to include both observations of near and distant earthquakes;

3. Nature of activity in central region--includes both the material needed by the engineer and questions of propagation, the solution of which is urgently needed by the engineer;

4. Knowledge about the interior of the earth--of interest to the astronomer, seismologist, and geologist and derived from both near and distant earthquake records;

5. Simulation of earthquakes to study effects on structures--accuracy of simulation and the question of relation of models to full-size structures is in the field of the engineer."--W. Ayvazoglou.

THE THERMAL AND ELASTIC PROPERTIES OF ELINVAR: A STUDY OF AN ELINVAR SPRING IN THE GALITZIN VERTICAL SEISMOGRAPH AT KEW OBSERVATORY

By F. J. Scrase

Journal of Scientific Instruments, vol. 6, No. 12, 1929, pp. 385-392.

In discussing the results of a study of an Elinvar Spring in the Galitzin vertical seismograph, the author says:

A serious defect of the Galitzin vertical seismograph is the drift of the pendulum which is caused by the effect of temperature changes on the elasticity coefficient of the steel spiral spring. In order to overcome this disadvantage an elinvar spring was recently fitted to the vertical seismograph at Kew Observatory. After loading the spring, the 'creep' remained appreciable for several months. Moreover the rate of 'creep' was dependent on the temperature. After making due allowance for these effects it was found that the temperature coefficient of the elastic constant of the elinvar spring was about one-tenth of that of the steel spring.

Data on the dimensions of springs (elinvar and steel), determinations of elastic constant and description on the seismograph observations are given.

The results, applied to the elinvar spring when under a load of about 40 kilograms, are summed up by the author as follows:

(a) The extension under an added weight of one gram is 0.0043 millimeters, that is, 0.0027 per cent of the unstretched length.

(b) The extension under an increase in temperature of 1°C. is 0.0038 millimeters, that is, 0.0024 per cent of the unstretched length.

(c) The rate of creep at the end of one month from the time of loading is of the order of 0.01 millimeter per day. At constant temperature it decreases inversely as the time.

(d) It has not been possible to give any reliable information about the effect of temperature on the rate of creep in the early stages, but the following figures show the effect at the end of six months:

At 5°C. the rate of creep is 0.00047 millimeters per day
At 10°C. the rate of creep is 0.00058 millimeters per day
At 15°C. the rate of creep is 0.00088 millimeters per day.

In the last part of the article the author discusses the practical vantages resulting from using the elinvar spring.--W. Ayvazoglou.

NATURE OF CERTAIN DISCONTINUITIES IN THE EARTH

By Reginald A. Daly

Bulletin of the Seismological Society of America,
vol. 20, No. 2, 1930, pp. 41-52.

Four different kinds of experimental evidence suggests that the seis- ically effective compressibility of a rock is of the order of one-fifth less an its compressibility as determined by the high-pressure method. Additional ecially designed experiments to test this idea are urgently needed. As it ands, the tentative conclusion implies that the crystalline Sial of a con- nental block is essentially granitic down to a depth not far from 30 kilo- ters. Below that shell a second shell of granodiorite or quartz diorite is dicated. At the depth of about 45 kilometers is a major discontinuity, which, terpreted on the same basis, represents the interface between the second ell and crystalline basalt, or gabbro. According to Gutenberg's hypothesis, is third shell contacts with a fourth underlying shell of vitreous basalt, e thickness of which is not now to be readily determined from the wave veloci- es in depth. So far as seismological evidence goes, that thickness may possi- y approach 1,200 kilometers. A shell of either crystalline or vitreous ridotite near the earth's surface is not suggested by the wave velocites. e master discontinuity at the depth of 2,900 kilometers seems capable of at ast two different explanations.--Author's abstract.

PROGRESS IN AMERICAN SEISMOLOGY

By A. L. Day

Eastern Section of the Seismological Society of America,
Proceedings of the 1930 Meeting, Washington, D. C., pp. 65-70.

A brief historical review of the conditions of seismological work ring the last 10 years is given; steps taken for the advancement of this rk by organizations interested in seismology are mentioned.--W. Ayvazoglou.

EINE NEUE WÜRTTEMBERGISCHE ERDBEBENWARTE

(A NEW SEISMIC OBSERVATORY IN WÜRTTEMBERG)

By E. Kleinschmidt

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 370-376.

The author gives a description of the place and of the equipment of the new seismic observatory.

Based on the tests carried out in the observatory it was proved that, notwithstanding its vicinity to the large city, the choice of the observatory site must be considered satisfactory.

Two seismograms by which the specialists may be convinced that the instruments are not affected by the traffic of the city are given.--W. Ayvazoglou.

4. ELECTRICAL METHODS

EARTH-RESISTIVITY SURVEY AT HUANCAYO, PERU

By W. J. Rooney and O. H. Gish

Terrestrial Magnetism and Atmospheric Electricity, vol. 35, No. 2, 1930, pp. 61-72.

This survey, carried out in the high Andes near the Huancayo (Peru) Magnetic Observatory of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, is one of a series of earth-resistivity surveys made in connection with the study of earth currents at observatories where potential gradient registration is in progress. The general resistivity of the region and its variation with position, depth, direction of current flow, and rainfall were determined. All may affect potential records and are indicative of the geological structure.

The resistivity of soil near the surface varied from over 100,000 to less than 2,000 ohm-centimeters, depending on the character of the overburden. The mean values tended to converge to a value around 10,000 ohm-centimeters as earth to depths of 200 to 300 meters was included in the measurements. These results are typical for an underlying structure of sedimentary rocks. A local area of high resistivity (values three times the mean for the region as a whole was found near one earth-current line and explains the high potential-gradient records obtained from that line. The results were found to be independent of the orientation of the survey lines, indicating that the region is laterally isotropic. The seasonal variation was small and relatively unimportant.--Authors' abstract.

DIE ELEKTRISCHEN METHODEN DER ANGEWANDTEN GEOPHYSIK

(ELECTRICAL METHODS OF APPLIED GEOPHYSICS)

By J. N. Hummel

Special print from the "Handbuch der Experimentalphysik," vol. 25, No. 3, 1930, pp. 401-462.

The book contains the description of the theory of the electrical thods:

Chapter I - General fundamental principles:

1. Physical fundamental principles;

2. Technical fundamental principles;

3. Geological fundamental principles;

4. Physical and geological common work.

Chapter II - Investigation of stationary fields (direct current methods

1. Potential functions

   (a) Fundamental equations and the derivation of the potential;

   (b) Three auxiliary means for the calculation of the potential;

   (c) Path of circuit and conductivity.

2. Qualitative determination of the direction (potential line methods)

   (a) Principle of the potential line measurement;

   (b) Determination of natural sources of the current (self-potential method;

   (c) Determination of conductivity differences;

   (d) Calculations made on some examples.

3. Quantitative measurements (resistance methods)

   (a) Determination of the apparent specific resistance (four points method);

   (b) Measurement of the resistance.

Chapter III - Quasi stationary proceedings (alternating current methods):

1. Induction currents and displacement currents;

2. Fields produced by means of electrodes (galvanic methods)

   (a) The electromagnetic field;

   (b) Investigation of the electric field (probe methods);

   (c) Investigation of the electric field (frame methods).

3. Fields produced by induction (induction methods)

   (a) Secondary fields;

   (b) Horizontal circular primary current;

   (c) Horizontal straight line primary current;

   (d) Vertical primary circle.

4. Adjusting of the oscillatory circuit.

Chapter IV - Investigation of dynamic proceedings (wave methods):

1. Hertz's radiation equation for a pair of electric poles (dipol);

2. Reaction upon the exciter of the field

   (a) Influence of horizontal layers upon a horizontal dipol;

   (b) Measurement of the damping (quarter-wave method).

3. Measurement of field intensity;

   (a) Determination of absorption (absorption methods);

   (b) Determination of interference (reflection methods).

4. Determination of polarization condition

   (a) Determination of the plane of polarization;

   (b) Determination of ellipticity.

Thirteen diagrams illustrate the article.--W. Ayvazoglou.

BUSHVELD, TRANSVAAL, SOUTH AFRICA - SUMMARIES OF RESULTS FROM GEOPHYSICAL SURVEYS

By R. D. Hoffman

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 369, 1930, p. 15.

The author briefly summarizes his ideas concerning electrical surveying based on prospecting work carried out by a company in Bushveld, Transvaal, South Africa. He says:

1. Unless there is a detailed geological surface map and, if possible, one of the underlying rock structure, plus a competent engineer who is qualified to interpret results, in all likelihood the work will prove ineffective.

2. Unless the character of the ore and the size of the deposit or deposits lend themselves to electrical prospecting, the survey is of little use.

In a country like northern Canada, where there is heavy overburden, high cost of labor and a water level close to the surface--factors which make for expensive trenching--an electrical survey to extend the boundaries of a known deposit or deposits may well be conducted. In South Africa, however, were trenching costs are very low, because there is little water trouble and cheap negro labor, such a survey, in most cases, would be unwise.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

GAMMASTRAHLEN AN KALIUMSALZEN

(GAMMA RAYS ON POTASSIUM SALTS)

By Werner Kohlhörster

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 341-358.

A weak, very hard γ-radiation from potassium salts has been discovered. Its capacity of penetration is about twice as much as that of radium - C - γ rays but its intensity is only 5.10-11 times of that of the same rays; this was determined by measurements of the ionization strength of equal amounts of the substance. The radiation is in direct proportion to the content of potassium and must be assigned to the potassium atom, probably to K41. Owing to the fact that potassium salts are found in comparatively high concentration and are widely distributed they represent a geophysical factor the importance of which must be considered equal to that of radium.

A great number of articles of reference are mentioned.--Author's abstract translated by W. Ayvazoglou.

WIE TIEF DRINGEN DIE POLARLICHTER IN DIE ERDATMOSPHÄRE EIN?

(HOW DEEP DO THE POLAR LIGHTS PENETRATE INTO THE EARTH'S ATMOSPHERE?)

By Carl Störmer

Zeitschrift fuer Geophysik, vol. 6, No. 4-7, 1930, pp. 334-341.

The deepest aurora borealis measured by photograms penetrate into the earth's atmosphere to an altitude of approximately 80 to 82 kilometers. A typical occurrence observed on the night of February 26 to 27, 1929, is examined; six photograms taken with the length of the basis line equal to 65.7 kilometers are given. The mean altitude of the lower border of the band of the aurora borealis was 82.4 kilometers. The possibility of the penetration of the rays of aurora borealis to the surface of the earth and their relationship to penetrating radiation is discussed.--Author's abstract translated by W. Ayvazoglou.

PENETRATING RADIATIONS

By Ernest Rutherford

Proceedings of the Royal Institution of Great Britain,
vol. 26, No. 123, 1929, pp. 87-89.

In recent years there has been a rapid growth in our knowledge of new types of electromagnetic radiations of very short wave lengths which are able to penetrate great thicknesses of matter before they are absorbed. The discovery of X-rays, which correspond to light waves of very short wave length, opened up a new field of study, and this was further widened by the discovery that radium and other radioactive bodies emitted radiations of the same type, but of a far greater power of penetration. A still further extension of our ideas had come from the proof that there exists in our atmosphere a type of ultra-penetrating rays, often called the cosmic rays, of about 100 times the penetrating power of gamma rays. The frequency of vibration of these cosmic rays is from 100 to 1,000 million times greater than that of ordinary light.

The main factors which control the absorption of these radiations are now well understood. For ordinary X-rays the quantum of radiation in passing through the atoms of matter occasionally collides, or rather interacts, with one of the component electrons, and the whole wave energy of the quantum is given to the electron, which is set in rapid motion and ionizes the matter in its path. The chance of such a conversion of the energy of the radiation, called the photo-electric effect, increases rapidly with the weight of the atom, and falls off markedly as the frequency of the radiation is raised. It is for this reason that, weight for weight, heavy elements absorb X-rays much more easily than light elements.

Another process, called scattering, which leads to loss of energy from the radiation, is also always present. The effect of this is small for ordinary X-rays, but becomes predominant for very high frequency rays, and indeed controls the absorption. In this scattering process, called the Compton effect,

here is a peculiar type of interaction between the quantum and the electron nich differs markedly from the photo-electric effect. The radiation is cattered, and at the same time the electron is set in motion. The scattered adiation is degraded in frequency in amount depending on the angle of scatter-ng. In very penetrating rays the average frequency of the scattered wave is educed to about one-half for each scattering collision, and about half the nergy on the average is given to the recoil electron. Consequently when a ery penetrating radiation passes through matter recoil electrons of high speed nd degraded radiations are always present.

A number of experiments were shown to illustrate the laws of absorp-ion of penetrating radiations of the X-ray and γ-ray types. A new method de-ised by Professor H. Geiger for detecting and counting the individual recoil lectrons produced by the penetrating radiations in our atmosphere was shown n operation.

The experimental information is at present too scanty to fix with cer-ainty the origin and nature of these extraordinarily penetrating rays. It has een suggested that they come from outer space, and represent radiations which rise in the destruction on creation of atoms. The energy of the quantum in he most penetrating radiation measured by Millikan is of the order of 1,000 illion volts. It may prove significant that radiation of this energy may be xpected to arise if the proton can be converted into radiation by a single atastrophic process. Some time ago Jeans suggested that the transformation of rotons and electrons into the energy of radiation appeared to be necessary in rder to account for the long lives of the hot stars.--Author's abstract.

RADIOACTIVITY A TOPIC OF TO-DAYS GEOPHYSICS

By J. Korzujin

Boletin de la Asociacion Geofisica de Mexico,
vol. 1, No. 10-11-12, 1930, pp. 179-186.

In the first part of this article the author gives a brief review of he different geophysical methods of prospecting, pointing out some of the efects inseparable from certain methods.

The main part of the article consists of a discussion of the radio-ctive method of prospecting, which in the opinion of Korzujin must be con-idered to be the most up-to-date method.

Some accomplishments of scientists involved in investigations of adio-activity are mentioned; a few figures illustrate graphically the results btained by radiometric investigations in several cases.

The article is published in Spanish and English.--W. Ayvazoglou.

RADIOAKTIVE METHODEN

(RADIOACTIVE METHODS)

By J. N. Hummel

Special print from the Handbuch der Experimentalphysik, vol. 25. No. 3, 1930, pp. 519-539.

The pamphlet is divided into the following chapters and paragraphs:

Chapter 1 - Importance of radioactivity for Geophysics.

Chapter 2 - Geological and physical elements of the radioactive exploration work.

(a) Radioactive content and radioactive distribution in the earth's crust;

(b) Influence of radioactive decomposition upon radioactive distribution.

Chapter 3 - Measuring methods and measuring instruments.

Chapter 4 - Methods of exploration and their practical results:

(a) Investigation by measuring the activity of samples of the material;

(b) Investigation by measuring the whole radiation of the soil;

(c) Investigation by measuring the hard penetrating earth-radiation;

(d) Investigation by measuring the emanation content of the ground air.

Eight figures and a number of articles of reference are added.--W. Avvazoglou.

7. UNCLASSIFIED METHODS

KENNECOTT MINES, ALASKA - SUMMARIES OF RESULTS FROM GEOPHYSICAL SURVEYS

By Allen M. Bateman

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 369, 1930, pp. 7-11.

In this article Bateman expresses his opinion on the applicability of

geophysical methods of prospecting, based on the results obtained from an electrical and electromagnetic survey carried out at Kennecott. Conclusions drawn by him are briefly summarized as follows:

1. - Geophysical methods are under ordinary conditions an extreme valuable adjunct to geological work in ore finding. The two, however, can not be separated.

2. - Geophysical work in mining regions has its value chiefly in surveying specific areas in which mineralization is strongly suspected, as in the vicinity of known ore bodies or in potential ore areas. The author is not convinced that the expense and slowness of the work justify it for blind prospecting in areas that might be favorable but in which no ore is known.

3. - Geophysical work is not sufficiently standardized to convince the mine operator that negative areas contain nothing and that indicated conductors mean ore.

4. - For certain types of work some of the companies should do more experimentation of their own in the field in order to know whether their methods are adaptable to certain types of deposits, before they accept such work under see.--W. Ayvazoglou.

GULL LAKE, NORTH CENTRAL NEWFOUNDLAND - SUMMARIES OF RESULTS FROM GEOPHYSICAL SURVEYS

By E. Y. Dougherty

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 369, 1930, pp. 15-21.

Geological conditions of the region are described and shown in a figure. It was concluded that the highly electrically conductive ore minoral chalcopyrite, associated with the magnetic mineral pyrrhotite, presented favorable conditions for the effective joint use of electrical and magnetic surveys. Two main objectives were in mind:

(1) To locate and outline possible extensions of the known ore bodies;

(2) To locate new ore bodies, particularly ore bodies other than the known ore bodies that might be the source of the ore bowlders.

Based on the results two drill holes put down on the Mineral Point southwest extension to verify the electrical indications demonstrated the efficacy of the equipotential method in locating conceled zones of conductivity in this area; but in spite of the joint use of electrical and magnetic surveys, under favorable conditions, it was impossible to predict whether certain indications resulted from a concentration of chalcopyrite sufficient to make ore or merely from noncommercial sulphides.

Magnetic reactions were due in part to pyrrhotite and in part to magnetite and did not necessarily indicate important concentrations of associated chalcopyrite.

Electrical indications were pronounced over uncommercial sulphides as well as over ore. The fundamental limitations of geophysical surveys were evident, therefore.

The geophysical survey having for its object the location of unknown ore bodies gave no certain evidence of the efficacy of the methods used.

The author concludes that negative results might be attributed to the inability of the methods to locate conductive zones under a considerable covering of lake water or glacial overburden, but a fairer conclusion is that no strong conductive zones exist in the areas prospected.--W. Ayvazoglou.

SOUTHERN BRITISH COLUMBIA - SUMMARIES OF RESULTS FROM GEOPHYSICAL SURVEYS

By J. J. O'Neill

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 369, 1930, pp. 12-14.

The author describes briefly his experience concerning geophysical prospecting carried out in Southern British Columbia by two companies and draws the conclusion that there has to be a great deal more standardization in interpretation of results. If properly applied, assistance can be obtained from geophysical methods of prospecting, but so far at least results have not been interpreted in such a way as to gain much confidence.--W. Ayvazoglou.

CURSUS IN ANGEWANDTER GEOPHYSIK BEI DER REICHSANSTALT FUER ERDBEBENFORSCHUNG IN JENA VOM 7 BIS 12 APRIL, 1930

(COURSE OF LECTURES IN APPLIED GEOPHYSICS AT THE REICHSANSTALT FUER ERDBEBENFORSCHUNG IN JENA FROM APRIL 7 TO 12, 1930)

By H. Werner.

Kali und verwandte Salze, vol. 24, No. 12, 1930, p. 192.

Owing to the great interest shown during the last 10 years in geophysical methods of prospecting, the Reichsanstalt für Erdbebenforschung (Institute of Seismological Research) in Jena offered a one-week course of lectures to a limited number of persons having the necessary knowledge of geophysics in general. A lecture on a special method was usually delivered in the morning and its practical application in the field was carried out in the afternoon.

In consideration of the great success of this undertaking the course will probably be repeated.--W.Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN VOLUME 1, NOS. 10, 11, AND 12 OF THE "BOLETIN DE LA ASSOCIACION GEOFISICA DE MEXICO"

Boletin de la Associacion Geofisica de Mexico,
vol. 1, Nos. 10, 11, and 12, 1930, pp. 155-219.

1. The physical principles of the gravitational method of prospecting, by B. P. Nikiforov. The continuation of the Russian article translated into Spanish is given on pages 201 to 205. The first part of the same article is also given in English translation (pp. 174-178). Both translations are made by Prof. J. Korzujin.

2. Geophysical methods of prospecting, by Georges A. Boutry. Continuation of the French article translated into Spanish by L. Urguijo, Eng. (An abstract of Boutry's article was published in Geophys. Abs. No. 8).--W. Yvazoglou.

NUMEROUS GEOPHYSICAL PROSPECTS PROVE DISAPPOINTMENTS

By Jack Logan

The Oil Weekly, vol. 58, No. 7, 1930, pp. 136-137 and 276.

In this article Logan discusses the results of drillings accomplished during the first half of 1930 on numerous geophysical prospects in both the Texas and the Louisiana divisions of the Gulf Coast. These prospects are given in an accompanying table in which mostly recent discoveries made with both seismograph and torsion balance are included. The purpose of the table is to demonstrate that the development of these new prospects, interpreted in many instances as deep domes or other unfamiliar structures, is not attended with the phenomenal success marking early drilling on older geophysical discoveries consisting largely of shallow domes. On some of the later the first well yielded oil, and in numerous cases the first test encountered cap rock or salt. By reason of the slight promise offered by these recently tested areas, enthusiasm has died down greatly in the search for additional prospects.--W. Yvazoglou.

IN DEFENSE OF GEOPHYSICS

By John F. Weinzierl

The Oil Weekly, vol. 58, No. 11, 1930, p. 46.

Answering the recent criticism of geophysical methods of prospecting, Weinzierl writes:

> Critics must concede remarkable accomplishments by successful geophysical methods. Reputable geophysicists have as a whole been cautious in making reports. However, there have been times when a company was willing to develop some peculiar anomaly not falling under the category of known geophysical structures. These must be regarded as experiments and not thrown up to the geophysicists as blunders.

Differences in opinions and differences in methods of interpretation have caused disagreements as to geophysical discoveries. This, however, is the case in all exploratory work and is not peculiar to geophysics. As a whole, geophysicists have an enviable record. In fact, geophysicists set about to spoil the oil profession by producing such fields as Sugarland, Port Neches, Van, etc., with initial well production. Hence the disappointment when other areas do not produce with the first well. Give geophysics time and it will richly reward the patient considerate operator. It must be remembered that some form of geophysical picture can be had of any area. Should the time come for oil production from sand conditions other than our present structures, even then the geophysicist can give an interpretation from his more detailed work of an area. All in all, things are not so bad with geophysics, and critics had better withhold their opinion until more time has elapsed. They should be patient enough to give half as much time for the thorough testing of the geophysical anomalies as was accorded other previously discovered structural conditions.--W. Ayvazoglou.

9. NEW BOOKS

etti, G., and Alessio, A. Geofisica, gravita e magnetismo (geophysics, gravity and magnetism). Report of the scientific results of the De Filippi Italian Expedition to the Himalaya and Karakorum Mountains in Kashmir and Turkestan, 1913-1914. Series 1, vol. 2, Bologna, Nicola Zanichelli, 1929, 222 pages, 38 tables.

erican Institute of Mining and Metallurgical Engineers, Inc. Petroleum Development and Technology, 1930. 29 West 39th Street, New York, N. Y. (1930). 610 pages, illustrated, cloth. Price. $5.

s Erdöl. Fourth volume (of five) of the second edition of the great Engler-Höfer work. The present edition is under the general editorship of Dr. J. Tausz, who is assisted by a large number of collaborators. The fourth volume deals with chemical, physical, geological, and geophysical methods of research (Dr. A. Moos). 615 pages and 225 illustrations. Price: 68 marks paper and 71 marks linen bound. Verlag von S. Hirzel, Leipzig, C 1.

tenberg, B. - Lehrbuch der Geophysik (Textbook of Geophysics). With the cooperation of Ansel, Bartels, Benndorf, Born, Linke, Sieberg, Wegener, and Weickmann. 1,017 pages. The book is divided into 18 sections and 86 chapters. Published by Gebrüder Bornträger, Berlin.

issner, O. - Beiträge zu einer experimentellen Seismik (Contributions toward an experimental seismology). Veröffentlichungen der Reichanstalt fur Erdbebenforschung in Jena. Heft 9, 1929, 77 pages. Published by Verlag von Gustav Fischer in Jena.

rnetzky, H. - Grundzüge der Luft-und Erdbildmessung (Fundamentals of surveying by aerial and ground photography). 236 pages. Published by Gebrüder Bornträger, Berlin, 1928, price 12 marks.

80

10. PATENTS

1. GRAVITATIONAL METHODS

1,729,836 Patented Oct. 1, 1929.

TORSION BALANCE

Karl Kilchling, Freiburg, Germany

The invention relates to improvements in torsion balance of the Eötvös type. When effecting gravity measurements with a torsion balance of this type a fundamental requirement is that the torsion axis be adjusted vertically very accurately. The new arrangement and combination of parts renders the levelling superfluous, in that the balance adjusts itself automatically.

Claims allowed - 8.

1,733,407 Patented Oct. 29, 1929.

TORSION BALANCE FOR MEASURING DIFFERENCES OF GRAVITY

Hans Haalck, Berlin-Steglitz, Germany

In this invention the form of the beam is such as to simplify the construction of the whole apparatus and to afford a convenient handling of the instrument without disturbing its sensitiveness.

Claims allowed - 6.

1,737,660 Patented Dec. 3, 1929.

THREE-WEIGHTED TORSION BALANCE

Ervand Kogbetliantz, Paris, France

By increasing the number of beams the number of observations necessary in one point is reduced. As to the execution of such a balance, it is entirely similar to the usual Eötvös balance with two weights.

Claims allowed - 3.

1,747,651 Patented Feb. 18, 1930.

TORSION BALANCE FOR MEASURING THE GRAVITATION

Wilhelm Schweydar, Potsdam, Germany

A means is presented by which the balance beam is prevented from turning around its own axis, and by which the vertical rods are prevented from tilting to one or the other side.

Claims allowed - 7.

773,032 Patented Aug. 12, 1930.

TORSION BALANCE

Malcolm Dunbar, London, England

This invention is chiefly directed toward the provision of a more con-
nient optical indicating and registering system, an important feature of which
the arrangement in the system of a fixed graduated index or scale, the image
which is reflected by the mirror on the bar so that it can be read through a
nveniently situated sight aperture furnished with a cross wire or other datum
rk. This arrangement enables direct readings of the deviations of the bar to
taken in numerical values and thus determination of the readings by the meas-
ement of charts or diagrams is avoided.

Claims allowed - 12.

774,516 Patented Sept. 2, 1930.

TORSION BALANCE FOR GRAVITATIONAL MEASUREMENTS

Karl Kilchling, Freiburg-im-Breisgau, Germany

The method according to this invention aims at shortening the observa-
ion time required for a station, as well as to render the circumstantial compu-
ition superfluous. The basic idea of the method consists in ascertaining the
eflection of the suspended attraction members not only in five azimuths, but in
l, and to render it possible to read directly the direction and the magnitude
the gradient from the numerical values and the graphic representation of the
me after one preceding gaging of the scale.

Claims allowed - 11.

2. MAGNETIC METHODS

,748,659 Patented Feb. 25, 1930.

METHOD AND APPARATUS FOR MAGNETIC PROSPECTING

Karl Sundberg, Stockholm, Sweden

An artificial magnetic field is established in the earth by use of a
irect current passing through a closed loop laid out on the earth's surface,
nd determinations are made by measurements with respect to said field.

Claims allowed - 5.

3. SEISMIC METHODS

1,738,094 Patented Dec. 3, 1929.

SOUND LOCATING APPARATUS

George A. Caldwell, of Milton, and C. Birchall, of Reading, Mass.

This apparatus comprises a pair of geophones connected by tubes with ear pieces. The apparatus takes advantage of the principle that the ear recognizes the direction from which sound comes. In using the apparatus the two geophones are moved about against the surface through which the vibrations are coming, until a point is found where the sounds have the same intensity in both ears. The direction in which the sound comes will be perpendicular to a line connecting the two geophones.

Claims allowed - 8.

1,743,358 Patented Jan. 14, 1930.

METHOD OF LOCATING SALT OR ROCK LAYERS

Johann G. Koenigsberger, Freiburg, Germany

The present invention refers to a method of determining the situation and form of salt deposits, gravel and rock layers, and the like. It is based on the use of acoustic waves and electroacoustic apparatus to record these waves and makes use of the modern sound-detecting apparatus, with or without amplifier tubes connected with oscillograph tubes or other recording devices, or without such the novel object as regards the use of acoustic waves being the locating of salt deposits, the extension of the boundaries of layers of gravel, and the like.

Claims allowed - 4.

4. ELECTRICAL METHODS

1,775,502 Patented Sept. 9, 1930.

APPARATUS FOR MEASURING EARTH RESISTANCES

Manfred Schleicher, Berlin-Charlottenburg, Germany

This invention relates to an apparatus for measuring earth resistance and diffusion resistance of the type of the so-called zero method; that is, the apparatus includes a circuit with an indicating device having a scale, and proper adjustment is made until no current flows in such circuit and the indicating device therefore points to zero. This invention has for its object to provide an apparatus operating to the zero method but avoiding the drawbacks which have so far interfered with the satisfactory use of zero-method apparatus.

Claims allowed - 3.

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GEOPHYSICAL ABSTRACTS[1]

No. 20

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

METHODS OF REDUCING GRAVITY OBSERVATIONS

By Walter D. Lambert

Gerlands Beiträge zur Geophysik, vol. 26, No. 2, 1930, pp. 185-188

The methods for reducing gravity observations will vary according to the purpose for which the results are to be used. For a land station Prey's method, recommended by Hopfner, would give approximately the actual value of gravity at a point within the crust directly under the gravity station. A system of values of gravity thus derived would, however, be useless either for studying the inhomogeneities of the earth's crust or for determining the figure of the earth. For these two purposes values of gravity derived from the potential for external space are needed.--Author's abstract.

DIE HYPOTHESENFREIE REDUKTION UND NUMERISCHE VERARBEITUNG DER BEOBACHTETEN SCHWERKRAFTWERTE

(THE AHYPOTHETICAL REDUCTION AND NUMERICAL WORKING UP OF THE OBSERVED GRAVITY VALUES)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 25, No. 4, 1930, pp. 339-347

From the results of gravity measurements and in connection with the formulas of Clairaut and Stokes, the face of an earth plane at sea-level may be determined synthetically without the aid of the hypothesis of distribution of masses inside the earth crust. Disputes about the isostatical distribution of masses inside the earth crust might be decided by computing with this method because the amount of the undulation becomes known.--Author's abstract.

UEBER EINE ABSTIMMVORRICHTUNG DER HALBSEKUNDENPENDEL STÜCKRATHSCHER FORM

(ARRANGEMENT FOR ADJUSTING HALF-SECOND PENDULUMS OF STÜCKRATH'S TYPE)

By M. Rössinger

Zeitschrift fuer Instrumentenkunde, vol. 50, No. 9, 1930, pp. 552-554.

In order that the "process of phase-opposition oscillations" (Gegenschwingungsverfahren) may be used successfully during practical pendulum measurements, it is desirable that the periods of oscillations of two pendulums swinging in opposite directions coincide as much as possible. Therefore the author thought it necessary to provide the pendulums with an arrangement by which, in addition to the adjustments made by the manufacturer, the observer can make accurate adjustment also.

Such an arrangement introduced into the four-pendulum apparatus constructed by the Askania-Werke in Bamberg is described in this article.--W. Ayvazoglou.

UEBER DEN EINFLUSS DES ERDMAGNETISCHEN FELDES AUF DIE SCHWINGUNGSZEITEN VON NICKELSTAHLPENDELN

(THE INFLUENCE OF THE EARTHMAGNETIC FIELD ON THE TIME OF OSCILLATIONS OF NICKEL STEEL PENDULUMS)

By M. Rössinger

Zeitschrift fuer Instrumentenkunde, vol. 50, No. 9, 1930, pp. 551-552

In this article the author examines the influence of the earthmagnetic field on the time of oscillations of nickel-steel pendulums and gives the results of this examination.--W. Ayvazoglou.

2. MAGNETIC METHODS

UEBER DIE MAGNETISCHE EIGENSCHAFT VON GESTEINEN

(ON THE MAGNETIC PROPERTY OF ROCKS)

By J. G. Koenigsberger

Terrestrial Magnetism and Atmospheric Electricity, vol. 35, No. 3, 1930, pp. 145-148.

The topographical magnetic effect in the Alps and in the Black Forest are given approximately by the magnetic induction calculated from the observed susceptibility; the same is true according to Carlheim-Gyllensköld for anomalies caused by the magnetic ore of Lapland. But Folgheraiter, Brunhes, David, and Chevallier could explain their observations only by remanent magnetization of the rocks studied. The author has therefore studied this question and found that all rocks have remanent magnetization, induced during cooling between 450 and 600° C., which is for intrusive igneous rocks about 0.2 to 0.8 of the induction (J_k) calculated from the observed susceptibility and the total intensity at this time. Many intrusive rocks, especially lavas, have a higher ratio -from 1 to 10. This high ratio must be explained by a remanent magnetization near saturation and a large coercive force; the available inductive susceptibility at 20° C. is now smaller than was the corresponding susceptibility at the higher temperature above 400°. The variability of this ratio suggests a variability of some physical conditions, for example, movements, during the time of cooling at the temperature at which magnetization becomes remanent. The average influence of the remanent magnetization of intrusive and of many extrusive rocks at some distance is often very small, while the direction of the magnetization is changing rapidly, as was proved by measurements on different rocks. The absolute value of susceptibility (K) and of the remanent magnetization (J) is often not constant in a cube of 4 to 7 centimeter edge.

This inhomogeneity u_1, u_2, u_3, and the anistropy a_1, a_2, a_3, were also measured for the three directions of a cube of the rock.--Author's abstract.

EARTH MOVEMENTS AND TERRESTRIAL MAGNETIC VARIATIONS

By Ross Gunn

Terrestrial Magnetism and Atmospheric Electricity,
vol. 35, No. 3, 1930, pp. 151-156

It is shown that a general contraction of the earth or a movement of a small part of it may give rise to appreciable disturbing magnetic fields. The movement of a conducting region inside the earth across the earth's magnetic field sets up electromotive forces which may produce large current systems. These current systems can give rise to the observed magnetic variations if the conductivity of the earth's core is sufficiently large.

Earlier determinations of the resistivity of the earth's core are found to be to several orders of magnitude too high, due to the neglect of skin effects. It seems probable that the electrical time-constant of the earth's core is not less than 1,000 years, and therefore magnetic diurnal variation data can not be used to calculate its conductivity.--Author's abstract.

EARLY DECLINATION OBSERVATIONS, KAMCHATKA TO BERING STRAIT

By W. N. McFarland

Terrestrial Magnetism and Atmospheric Electricity,
vol. 35, No. 3, 1930, pp. 161-164

This article contains a list of measurements of the magnetic declination at 23 points along the Siberian coast from Kamchatka to Bering Strait, as observed by the officers of Bering's expedition of 1728 and 1729, together with a declination chart of the region based on the observations.--Author's abstract.

LATEST ANNUAL VALUES OF THE MAGNETIC ELEMENTS AT OBSERVATORIES

By J. A. Fleming

Terrestrial Magnetism and Atmospheric Electricity,
vol. 35, No. 3, 1930, pp. 165-172

Annual values of the magnetic elements observed at a very large number of observatories (91) scattered all over the world are compiled by the author.

In the remarks accompanying the list the author notices that the uneven distribution of magnetic observatories is strikingly evident and in particular the lack in the southern hemisphere, especially in Africa and the oceanic areas. Locations in which fully equipped observatories, which would contribute greatly to the needs of research in terrestrial magnetism, should be established are mentioned.--W. Ayvazoglou.

DAS NEUE OBSERVATORIUM IN NIEMEGK

(THE NEW OBSERVATORY IN NEIMEGK)

By A. N. Nippoldt

Terrestrial Magnetism and Atmospheric Electricity, vol. 35, No. 3, 1930, pp. 180-181

Tells briefly of the installation of a new observatory in Niemegk with its directors remaining in Potsdam. The old buildings in Potsdam are transformed into geomagnetic laboratories. The new observatory received the name "Adolf Schmidt Observatory for Earth Magnetism" in commemoration of Prof. Adolf Schmidt, whose seventieth birthday was celebrated on the day of the opening of the observatory.--W. Ayvazoglou.

SUR LES PROPRIÉTÉS MAGNÉTIQUES DES ROCHES

(ON THE MAGNETIC PROPERTIES OF ROCKS)

By G. Grenet

Annals Physique, Paris, vol. 13, March, 1930, pp. 263-348

An abstract of this article is published by H. Harradon in the Terrestrial Magnetism and Atmospheric Electricity, vol. 35, No. 3, 1930, p. 183. The abstract reads as follows:

The first part of the paper is devoted to a historical sketch in which the author passes in review the work of the principal investigators who have occupied themselves with the study of the magnetization of rocks and summarizes their individual contributions to our knowledge of the subject. He then comments critically on the various methods employed for determining the magnetic susceptibility of rock samples and gives a detailed description of the two instruments selected for his own measurements, namely, a Curie-Cheneveau balance with certain modifications and a Hughes induction balance especially adapted to the rapid determination of the coefficient of magnetization of rock samples of moderate size. The use of this latter instrument is justified on the ground that the eddy currents induced in the samples do not vitiate the measurements to an appreciable extent.

A detailed exposition and discussion of the results of the investigations are given, from which the author draws the following conclusions: (1) Although the classification of rocks used in petrography does not conform to a classification of the magnetic properties, rocks rich in ferromagnesian constituents are in general more magnetic than rocks poor in these elements; (2) an examination of thin sections by a polarizing microscope shows that the values of the susceptibility observed are explained by the magnetic content of the respective samples; (3) in the present state of our knowledge, it may be assumed that magnetite is the principal magnetic constituent of

rocks although the experiments of various investigators seem to prove that certain rocks contain other magnetic substances which are revealed by their Curie points; (4) the experiments of A. Michel-Levy and the author show the relations observed between the increase of susceptibility of certain rocks after heating and the changes brought about in their constituent minerals; (5) rocks of fluidal texture have a slight magnetic anisotropy.

The investigations described were made at the Institut de Physique du Globe of the University of Paris.

A bibliography containing 64 titles concludes the paper.-- H. D. Harradon.

BESTIMMUNG MAGNETISCHER SUSZEPTIBILITÄTEN VON GESTEINEN UND MINERALIEN IN SCHWACHEN MAGNETISCHEN FELDERN

(DETERMINATION OF MAGNETIC SUSCEPTIBILITIES OF ROCKS AND MINERALS IN WEAK MAGNETIC FIELDS)

By J. Koenigsberger

Centralblatt fuer Mineralogie, Geologie und Palaeontologie, 1929, Abt. B, No. 4, pp. 97-107

In this article the author discusses the application of a method by which the determination of the susceptibility of rocks and minerals in weak magnetic fields is possible and which is especially useful if many samples, not all of which can be brought to the laboratory, are to be investigated. The method is explained on the basis of examples and illustrated by figures.-- W. Ayvazoglou.

UEBER DAS MAGNETISCHE VERHALTEN VERSCHIEDENER HARZGESTEINE

(ON THE MAGNETIC BEHAVIOR OF VARIOUS HARZ-ROCKS)

By H. Reich and W. Wolff

Centralblatt fuer Mineralogie, Geologie und Palaontologie, 1929, Abt. B, No. 5, pp. 153-161

In this article the authors give the results of their investigations made on the magnetic effect of various Harz-rocks. These investigations may serve as a basis for future work. The most important result of the investigation consisted of the fact that a relatively strong magnetic effect of the red hematite deposit in the central Harz was proved. The magnetic profile given in the article shows a surprising conformity with the known geological conditions of the region.

The results of investigations made by the authors upon various Harz-rocks are summed up as follows:

1. The Paleozoic sediments of the Harz are magnetically very weak. The susceptibility of Wissenbacher slate is slightly higher and that of Culm sediments is lower than the susceptibility of the other layers.

2. The behavior of the deep rocks of the Brocken and Ramberg is varied. The granites of the Ramberg massif are magnetically very weak and do not differ greatly from the sediments surrounding them. On the other hand, the diorites and perhaps one part of the border granites of the eastern zone of the Brocken massif are magnetically very strong.

3. Eruptive rocks and dike rocks. The effects of diabases and keratophyres are, of course, not as strong as those of the deep-rocks mentioned above, but sometimes the effects are very marked, especially in case of coarse-grained diabases. The meso-volcanic dike rocks are magnetically very weak.

4. The red hematite deposits have shown very high magnetic disturbance values owing to the presence of the magnetic modification of Fe_2O_3 as well as of magnetite.--W. Ayvazoglou.

COST OF MAGNETOMETER SURVEYING

By Dart Wantland

The Colorado School of Mines Magazine, vol. 20, No. 10, 1930, p. 24

Figures on the cost of magnetometer surveying, based on data furnished by an oil company, are given.

Four cases of surveying carried out in California, Western Canada, Southwestern Texas, and Texas (Panhandle) are examined.

The following factors are to be considered: Weather, personnel, topography, transportation, location in respect to section corners, lost time, depreciation of car and instrument, and salary.

According to the author the personnel factor is by far the most important one in a discussion of real cost; that is, cost measured in quality of the work done.--W. Ayvazoglou.

PRELIMINARY RESULTS OF GEOLOGIC-PROSPECTING WORK CARRIED OUT BY THE GEOLOGICAL COMMITTEE IN 1929 IN THE REGIONS OF IRON-ORE DEPOSITS (IN RUSSIAN)

By A. J. Serk

Osvedomitelniy bulleten po Poleznim Iskopaemim, vol. 3, No. 1, 1930, pp. 6-13

The author describes in this article the geophysical work carried out in addition to the geologic survey and drilling in the following regions of the U.S.S.R.:

In the Krivoy Rog a systematic magnetic method of prospecting was used in the region of Melitopol and Krementchug. An anomalous strip about 70

kilometers in length was established to the S.SW. of the city of Orékhov, as well as several other magnetic anomalies in the region of Krementchug and Nikopol.

New places of magnetic anomalies were discovered in the Troitsko-Osamsk deposits, as well as in the regions of Minusinsk and Nerchinsk in Siberia.--W. Ayvazoglou.

3. SEISMIC METHODS

UN NOUVEAU TYPE DE SISMOGRAPHE PHOTOGRAPHIQUE

(A NEW TYPE OF PHOTOGRAPHIC SEISMOGRAPH)

By P. Guido Alfani

Ciel et Terre, vol. 46, No. 6, 1930, pp. 147-154

The author of this article introduced at the end of 1925 at the Ximenien Observatory a photographic seismograph of Galitzine type but with some constructive changes. The new apparatus was tested during a long period of time and the details of its construction are published now after the results of tests have proved to be very satisfactory.

In this article Alfani gives the description of the seismograph (including the registering apparatus and the lamp) as well as its photographic picture and schematical design. In conclusion he says that, although only the well-known principles are utilized, the apparatus differs from those used generally in the following important particulars: (1) A new method of connection is used between the pendulum and the amplifying system by which the mechanical friction is omitted entirely, and (2) the coefficients of amplification and damping are much higher than those obtained in the other modern seismographs.

The value of the apparatus is increased still more owing to its simple construction, low price, facility in operation and perfection of seismograms. Two seismograms taken at the same time, one by a Galitzin seismograph and the other by the new photographic seismograph, are added to the article for comparison.--W. Ayvazoglou.

NÄHERUNGSFORMELN ZUR BERECHNUNG DER AMPLITUDEN DER ELASTISCHEN WELLEN DIE BEIM DURCHGANG EINER GEGEBENEN WELLE DURCH EINE UNSTÄTIGKEITSFLÄCHE ENTSTEHEN

(APPROXIMATE FORMULAS FOR THE CALCULATION OF THE AMPLITUDES OF ELASTIC WAVES GENERATED AT THE PASSAGE OF A GIVEN WAVE THROUGH A LAYER OF DISCONTINUITY)

By H. P. Berlage, Jr.

Gerlands Beiträge zue Geophysik, vol. 26, No. 2, 1930, pp. 131-140

K. Zoeppritz in his article (Ueber Reflexion und Durchgang Seismischer Wellen durch Unstetigkeitsflächen, Nachrichten Göttingen, 1919, p. 66) has

orked out the extremely complicated relations between the amplitudes of the ongitudinal and transversal reflected and refracted waves, generated at the assage of longitudinal and transversal seismic waves through a layer of discontinuity, in the abridged form of matrices.

The formulas given in this article are easier to operate with, but laim to be exact only in case of:

1. The reflection by a free surface (density of the second medium = 0);
2. Identity of the two media;
3. Reflection by a solid boundary (density of the second medium = ∞);
4. Any given density of the media, if the angles of incidence of the primary wave are 0 or 90°.

In every other case the formulas yield approximate values for the amlitudes of the secondary waves, with an error of probably not more than 0.1 of he amplitude of the incident wave.

The ratio of the velocities of propagation of condensational and disortional waves has been supposed to amount to 3. Thus liquid media have been uled out.

The formulas should be used only in cases when the denser medium ossesses greater velocity of propagation. Moreover, they do not extend to ases of total reflection.

The solution of two practical problems closes the paper.--Author's bstract.

DIE ERSTE BEWEGUNG BEI EINEM ERDBEBEN

(THE FIRST MOVEMENT PRODUCED BY AN EARTHQUAKE)

By M. Hasegawa

Gerlands Beiträge zur Geophysik, vol. 27, No. 1, 1930, pp. 102-125

Based on the quadrant distribution of the pull and shock of the first ovement produced by an earthquake, as calculated by T. Shida, it is possible to raw a supposition concerning the break inside of the material; this may be ormulated as follows: The internal break is caused by a shearing pressure in plane; the breaking movement depends only on this shearing pressure independent f other internal pressures existing there. The theoretical distribution of the irst movement of P and S caused by this shearing at one point of the break is alculated. The probable direction of the propagation of the break in the hypoenter is at the same time determined by this mathematical calculation. The disribution of the first movement depends on the proceeding of the break. If the

breaks have the same direction in all the points in the region of the hypocenter, then the first movement is distributed, in the first approximation, equally to that at the point of the break, although the amplitude ratio is more or less deranged.

It was proved by observation of the Tango earthquake that the pull and shock of the first movement produced by the break in a certain azimuth corresponds to the pull and shock of the first P-wave at the distant stations of the same azimuth. From this relation a theoretical conclusion is drawn, that the amplitude and the period of time of the first movement in the earthquake diagram are not the decisive factors for the first movement of the break but that they depend directly on the proceeding of the break.

The earthquake break (with the exception of comparatively deep earthquakes) has, as it seems, a tendency to be distributed in case of a horizontal shearing pressure along a vertical plane. The author examines also the distribution of the first movement in case of an inclined orientation of the break.

In conclusion, the author draws attention to some problems concerning the quakes caused by collapses and explosions.--Author's abstract translated by W. Ayvazoglou.

AN ANALYSIS OF THE S-WAVE

By Frank Neumann

Bulletin of the Seismological Society of America,
vol. 20, No. 1, 1930, pp. 15-33.

Of the three elementary wave types radiating from a seismic focus (1) compressional or P-waves, (2) transverse or S-waves, and (3) surface or L-waves) the author examines in this article the S-wave, the nature of which remains to be explained in such a manner that it can be recognized from the motion of the earth particle at a seismographic station.

Headings of the article:

1. Description of the S-wave group;
2. Displacement diagrams and discussion of errors;
3. Illustrations;
4. Preliminary results;
5. Supplemental note on the theory of the S-wave.

In the summary to the article the author says:

The following empirical law governing the azimuth of S-wave impulses is advanced: (1) The azimuth of the horizontal S-wave impulse at the focus (the horizontal component of the initial earthquake displacement)

is equal to (2) the azimuth from station to epicenter, plus (3) the azimuth from epicenter to station, or back azimuth, minus (4) the azimuth of the S-wave displacement at any station; all azimuths being counted from north around by east through 360°. It states that a common direction of horizontal impulse or thrust at a seismic focus can be calculated from S-wave azimuths observed at two or more distant stations. These focal thrusts appear to be either parallel or normal to fault lines.

A theory is later developed which appears to substantiate the above-named law in so far as it concerns simple horizontal focal displacements. S-wave impulses, due to a simple vertical displacement at a focus, apparently follow the laws of longitudinal motion, but arguments are advanced to question the existence of this type of activity. The displacements are longitudinal only in the sense that they occur in the planes of the rays; they are not compressional waves.

Three distinct types of activity are found in the S-wave group.--. Ayvazoglou.

SEISMIC METHOD OF PROSPECTING (IN RUSSIAN)

By A. Seleznev

Vestnik Komiteta po delam izobreteniy (Gazette of the Committee for Examination of Inventions), No. 5 (67), May, 1930, pp. 1-3

The author discusses briefly the seismic method of prospecting and the use of seismographs and geophones.--W. Ayvazoglou.

4. ELECTRICAL METHODS

GEOELECTRICAL EXPLORATION METHODS USED IN OIL FIELDS

By Helmer Hedstrom

The Oil Weekly, vol. 58, Nos. 6 and 8, pp. 34-37 and 32-34.

The first part of this article presents, in a simple and nontechnical way, the principles underlying the use of geoelectrical methods for mapping of geologic structures. Different ways of applying electrical measurements for the surveying of structures are then described, and it has been attempted to make this presentation as elementary and easily understood to the average reader as possible. Detailed technical descriptions, which would be of interest mainly to those versed in the art of geoelectrical exploration, have been omitted, and reference to everyday physical phenomena are used to make clear the electrical phenomena in the subsurface. Thus the behavior of an electric current passing through the bordering surfaces between parallel layers with different conductivity is compared to the refraction and reflection of light at the contact planes between media like air, glass, and water (this comparison is, of course, fully justified, since the equipotential surfaces of an

electric current in such "stratified conductor problems" behave exactly like the wave fronts of light entering a stratified system). Further, the electromagnetic induction of electric currents in subsurface beds is explained by reference to the action of the industrial transformer and to simple laboratory experiments.

Of the geoelectrical methods dealt with, the electromagnetic process is stated to be the most important and most widely used. This method, which is given a fairly complete description, consists in measuring the different phase components of the electromagnetic field produced by an alternating current in a wire laid out on the ground. The measuring apparatus, as employed in the field work, is shown in a photograph; it consists of a search coil and a compensator, referred to in the article as "an instrument used in physical laboratories." The electromagnetic field is measured in the semiabsolute units of microgauss per ampere primary current.

It is explained, and shown by a diagram, how the presence of conducting beds in the subsurface will modify the alternating electromagnetic field, and how it is possible, by the measuring of this field, to determine not only the depth of such "electrical key beds," but also their electrical characteristics.

The result of a survey by this method is a structure map showing contour lines drawn on some outstanding "electrical key bed," with a depth ranging from 200 to 1,500 feet. It is stated that this process is much faster and cheaper than core drilling, for which it offers a substitute.

The second part of the article presents some examples of practical results obtained by the electromagnetic method. Such investigations have been used for a variety of structural problems in Texas, Louisiana, and California, where up to now a total area of between 1,500 and 2,000 square miles has been covered by electromagnetic surveys. Four maps and one diagram with sections are given, which show good agreement between the results from the electrical survey and the geological data obtained from subsequent drilling.--Author's abstract.

ZUR MESSUNG DER ELEKTRISCHEN LEITFÄHIGKEIT DER ERDE DURCH INDUKTION

(ON THE MEASUREMENT OF THE ELECTRICAL CONDUCTIVITY OF THE EARTH BY INDUCTION)

By J. Koenigsberger

Physikalische Zeitschrift, vol. 31, No. 10, 1930, pp. 478-485

The vertical component of the magnetic field strength produced by induced currents is calculated. These currents were induced in an infinite conducting semispace (Halbraum) by means of a circular current with a fixed radius passing through a very thin wire placed at the border of the semispace. Skin effect, small phase displacements, and screening off (Abschirmung) were neglected in the beginning. The errors produced by this were estimated. The semiempirical formula for the magnetic field of a current in a flat wire-circle is discussed and proved by observations. Only the first part of this formula is used during the integration; errors occurring by this are estimated..

he theory is applied to the earth, considering it a semispace; the observations roved that the resistance of the upper earth strata agreed in order with the esistance expected (3.10^4 ohms per cubic cm.).

For penetrating to depths of over 1 to 20 kilometers, frequencies less han 500 H are necessary. Sources of experimental errors and difficulties aused by this are explained briefly.--Author's abstract translated by W. yvazoglou.

THE INFLUENCE OF RAIN ON THE ATMOSPHERIC ELECTRIC FIELD

By A. Venkata Rao Telang

Terrestrial Magnetism and Atmospheric Electricity, vol. 35, No. 3, 1930, pp. 125-131

Photographic records of the atmospheric-electric field variations at imes of rains are examined along with pluviograms covering these periods. It s found that the normal effect of rain is to reverse abruptly the normal ositive field in the early stages, while in a few cases it results in a sudden eduction without change of sign. This abrupt change disappears speedily when he disturbing shower is of short duration. An analysis of the results of G. C. impson at Simla (1908-1909) in regard to the charge brought down by rain is iven. It is shown that in the earliest stages of charged rain, in more than per cent of the cases the net charge brought down by rain is positive. It s then shown that the effect of rain on the field is due to the transfer of harge by the rain from the upper air.

Calculation shows that the charge transferred by the rain is of the rder necessary to produce the observed changes of potential. The explanation overs the cases of heavy rain attended with frequent reversals and very high alues of the field.--Author's abstract.

DIE HERTZSCHEN GLEICHUNGEN UND DEREN LÖSUNG FÜR DAS ÄUSSERE ERDMAGNETISCHE FELD

(HERTZ'S EQUATIONS AND THEIR SOLUTION FOR THE EXTERNAL EARTHMAGNETIC FIELD)

By A. Sloutschanowsky

Gerlands Beiträge zur Geophysik, vol. 26, No. 3, 1930, pp. 333-350

The subject of the proposed work consists of finding out the solutions f Maxwell Hertz's equations under the following conditions: A homogeneous edium rotates about the axis R with a small constant angular velocity W_o under upposition that the axis R in its turn rotates with a constant angular velocity o about an immobile axis R_o to which R is parallel. The region to be considered s the space between the two concentric spheres with their center at the point which is taken on the axis R and remains on it during its motion together with he medium. The components of the magnetic field, which alone are subject to ur consideration, are reported to the system of the coordinates with the center

at the point O, firmly adjoined to the medium, which system in such manner wholly participates in the motion of the considered medium. The indicated solution can, to a certain degree, serve for the representation of the external magnetic field of the earth from its surface to the higher layers of the atmosphere.--Author's abstract.

SUR LES PROSPECTIONS ÉLECTRIQUES DU PÉTROLE

(ON ELECTRICAL PROSPECTING FOR OIL)

By A. Belluigi

La Revue Pétrolifière, No. 394, October, 1930, pp. 1451-1454.

Based on experience gained with electrical methods of prospecting, two opposite opinions on the direct discovery of oil are maintained at the present time; one supports the possibility of the direct discovery and the other denies this possibility.

In this article Belluigi discusses this question and defends his viewpoint, expressed in one of his previous works (Electrical Prospecting for Oil, L'Elettricita, No. 4, 1928) that all the different systems of electrical prospecting for oil may give good results if applied in places indicated and designated by geologists.--W. Ayvazoglou.

THE EARTH RESISTIVITY METHOD OF GEOPHYSICAL PROSPECTING; SOME THEORETICAL CONSIDERATIONS

By G. F. Tagg

The Mining Magazine, London, vol. 43, No. 3, 1930, pp. 150-158

Theoretical considerations illustrated by a series of curves and an actual example are given.

In conclusion the authors says that the extent to which results obtained theoretically can be of assistance in translating the observations obtained in the field must, of course, depend upon how closely the actual formations investigated approximate the conditions assumed in the theoretical investigations. In cases where the practical conditions approximate fairly closely those which have been considered, the results of the theoretical treatment given should serve as a useful guide to the way in which the practical observations are to be interpreted.--W. Ayvazoglou.

ELECTRICAL LOGS AND CORRELATIONS IN DRILL HOLES

By Conrad and Marcel Schlumberger

Mining and Metallurgy, vol. 10, No. 275, 1929, pp. 515-518

By making an "electrical log," the authors mean an operation to determine electrically the characters of formations traversed in drilling, the

termination being carried out by means of measuring the electrical resistivities of the rocks along the uncased portions of drill holes. As in the case an ordinary core record, this process indicates a geological study of the rata, and for that reason it is given a similar designation.

The paper is divided into three parts:

1. Electrical resistivities of rock formations: In this section e authors discuss in considerable detail the factors affecting the resistivies of various kinds of rocks.

2. Technique employed in making these electrical logs: In order to asure the resistivity of a formation at a certain depth in a drill hole, apopriate apparatus is lowered on the end of an insulated electric cable to e given horizon. The measuring arrangement is especially designed to eliminte entirely the perturbations due to the conductivity of the water in the ill hole and to the phenomena of polarization provoked by the current flow. e data obtained permit drawing up a diagram which constitutes the Schlumrger electrical log. The illustrations show several such logs.

3. Applications of the electrical log: The recovery of a core and s complete litholcgic and paleontolcgic examination will, of course, almost ways give more information than will the determination of the electrical reistivity of the rock to which it belongs. Thus, the electrical "core" should considered as an auxiliary to the core of stone and is called on to replace e latter simply because it is much cheaper, more rapid, and frequently more isily employed.--W. Ayvazoglou.

A NICKEL-COPPER DEPOSIT IN NEW BRUNSWICK, CANADA

By Bela Low

Engineering and Mining Journal, vol. 130, No. 3, 1930, pp. 115-118.

The article begins with a brief description of the geology of the gion. An electrical survey on the Rodgers, Hall-Carroll, and intervening round was carried out before any drilling was done. The inductive method was plied. The results of trenching checked well with the electrical conductor tlined in the survey. On the Rodgers lens a strong indication of the presce of a conductor coincided well with the known sulphide lens. Owing to the ct that outcrops were scarce, the area being partly farm land and partly timr of second growth, it was deemed best to establish favorable locations for ditional explorations by means of a magnetic survey.

Regions of magnetic anomalies were found. No exploration work has yet been done along these magnetic anomalies, but the logical assumption is hat they represent pyrrhotite bodies.

Maps are given showing (1) schist-gabbro contact and the location of wo sulphide lenses and magnetic anomalies, (2) trenches and diamond-drill oles on Rodgers lens, and (3) dip-needle readings and position of electrical onductor in relation to surface outline of Rodgers lens are given.

Results of metallurgical research conclude the article.--W. Ayvazoglou.

GEOPHYSICS USED IN TRACING KEWEENAWAN FAULT

Editorial note

Engineering and Mining Journal, vol. 130, No. 5, 1930, p. 245

The geophysics department of the Michigan College of Mining and Technology has undertaken the important geological task of locating definitely the Keweenawan fault in localities where its real position has never been established.

The Keweenawan is the major fault of the district, bounding the copper-bearing series on the south from the end of the Keweenaw peninsula to Lake Gogebic.

The character of the fault over its entire width can be determined, and the depth of the rock almost accurately calculated, by means of the varying electrical resistivity of the formations.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

EIN VERBESSERTES VERFAHREN ZUR BESTIMMUNG DES GEHALTES DER FREILUFT AN RADIUMEMANATION

(AN IMPROVED PROCESS FOR THE DETERMINATION OF THE CONTENT OF RADIUM EMANATION IN FREE AIR)

By Walter Kosmath

Gerlands Beiträge zur Geophysik, vol. 27, No. 1, 1930, pp. 42-46

In this article the author shows that the cocoanut-charcoal process (the "suction method"), although improved in 1928, is not entirely suitable for the determination of the content of RaEm at a certain moment, or for the determination of the vertical distribution of the emanation.

The author mentions the demands to which a method for the determination of the content of RaEm at a certain moment may answer.

The method suitable to these demands is discussed and its advantage in comparison with the "suction method" is noticed.

The process examined in the article may be of importance also in connection with bioclimatic, balneologic, as well as medical questions.

The proceeding can be employed also during flights in airplanes and balloons.--Author's abstract translated by W. Ayvazoglou.

UNTERSUCHUNGEN ÜBER SCHWERE JONEN IN DER ATMOSPHÄRE

(INVESTIGATIONS ON HEAVY IONS IN THE ATMOSPHERE)

By Hans Israel

Gerlands Beiträge zur Geophysik, vol. 26, No. 3, 1930, pp. 283-313

With the apparatus described in the "first report" (Gerlands Beiträge, ol. 23, 1929, p. 144) measurements were made twice a day during one year and he number of small and large, positive and negative ions, as well as the uclei of condensation, were counted, the latter with Aitken's Pocket Dust-ounter. A statistical study of the material obtained was made in connection ith the other meteorological data. The variation of the number of large and mall ions was always an opposite one. The nuclei of condensation had shown, f course qualitatively only, an attitude similar to that of the large ions. he influence of the large city upon the number of ions was very great. Their ependence on the air body could not be established beyond doubt owing to the isturbances caused by the city. Their relation to the relative humidity had hown that with the increase of humidity the conditions for the origination of arge ions were more favorable. The proportion between the nuclei and large ons was not constant and changed with the meteorological conditions. The dis-inct annual and daily period of the number of ions seems to be in conformity ith the amount of the inter-atmospherical change (Massenaustausch in der tmosphere).--Author's abstract translated by W. Ayvazoglou.

GEOPHYSICAL PROSPECTING - RADIOACTIVE METHODS

By John H. Wilson

The Colorado School of Mines, vol. 19, No. 6, 1929, pp. 19-21

A brief description of the properties of the radioactive materials nd tables of radioactive elements are given. The author discusses the follow-ng methods of radioactive prospecting:

1. Sample examination.
2. Atmospheric electricity method
3. Investigation of soil gases.
4. Penetrating radiation method.

Five figures and a selected bibliography are added.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

OBSERVATIONS GÉOTHERMIQUES DANS LE FORAGE STEBNIK 1

(GEOTHERMAL OBSERVATIONS IN THE STEBNIK 1 WELL)

By Stanislaw Zych

Institut de Géophysique et de Météorologie de l'Université de Lwow, vol. 4, Communication No. 44, 1929, pp. 844-848

Data of temperatures measured on December 2, 1927, at different depths in the Stebnik 1 well (near Boryslaw) are given in a table.

The increase of temperatures with the depth is small and distributed regularly. For the differences of depth of 50 meters the increase varies between 0.75 and 0.85° C. The mean geothermal degree is 63.4 meters.

By comparing this value with those obtained in Boryslaw and Kalusz for the same differences in depth, shown in another table, it was established that the depth temperatures in the Stebnik well are considerably lower. This seems to be probably in relation with the salt layers and potassium salt layers crossed by the wells at a depth from 116 to 859 meters. In Kalusz the smallest increase was also observed in the salt layers--that is between 174 and 261 meters of depth.--W. Ayvazoglou.

DIE VORAUSBESTIMMUNG DER GEBIRGSTEMPERATUR IM INNERN VON GEBIRGSMASSIVEN

(PREDETERMINATION OF TEMPERATURE OF ROCKS INSIDE OF MOUNTAIN-MASSIFS)

By K. Pressel

Zeitschrift des Vereins deutscher Ingenieure, vol. 73, No. 5, 1929, pp. 162-164

The author discusses the important question of determining the temperature of rocks inside of mountains. An attempt was made to solve this problem by mathematical calculations. Pressel describes methods in which the experiments are carried out on models. Possibilities of thermal and caloric model experiments are mentioned briefly. A third model experiment, an "electric" one, is described in more detail. Its usefulness was proved by observations made in two well-known tunnels (Gotthard, Simplon). The results of the latter examination are given.

The following items are discussed: (1) Importance of temperature determination; (2) literature on temperature determination; (3) influences upon the temperature inside of mountains; (4) thermal model-experiment; (5) caloric model experiment; (6) electrical model-experiment.--W. Ayvazoglou.

GEOPHYSICAL PROSPECTING - GEOTHERMAL METHODS

By John H. Wilson

The Colorado School of Mines Magazine, vol. 19, No. 8, 1929, pp. 13-17

Owing to the fact that geothermal methods may give valuable information under certain conditions it can be expected that future improvements in technique and in interpretation will provide a greater application in certain types of prospecting problems.

In this article the author explains the definitions and terms used in connection with geothermal research work and gives a table of thermal conductivities for a number of substances.

Under the heading "The heat of the earth" Wilson enumerates the conditions due to which the actual isogeothermal surfaces depart from the ideal shape of oblate spheroids as calculated theoretically. These conditions are given as follows: (1) Ocean floors, (2) mountain ranges and valleys, (3) nature of the rocks, (4) dip of the strata, (5) structural uplift and movement, (6) chemical action, (7) volcanic activity, (8) underground circulation of waters, and (9) climatic changes.

A number of different types of thermometers and cases used for depth-temperature measurements in wells are shown.

Interpretation of depth-temperature curves, illustrated by graphs, is discussed.

A figure of Salt Creek oil field, Wyoming, showing structural contours on Second Wall Creek sand and depths to the isogeothermal surface of 80° (according to Van Orstrand) is given, being one of the best examples of the relation between structural uplifts and geothermal anomalies.

In conclusion some other applications of the depth-temperature measurements are mentioned.--W. Ayvazoglou.

GEOTHERMAL VARIATIONS IN OIL FIELDS OF LOS ANGELES, CALIFORNIA

By Anders J. Carlson

The Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 8, 1930, pp. 997-1011

Data obtained from temperature measurements in oil wells of the Los Angeles basin are presented, and some causes of abnormal temperature conditions and factors affecting the interpretation of geothermal data are noted. The relations of geothermal gradients and isothermal depths to structure are discussed for the Santa Fe Springs, Long Beach, and Torrance fields. Variations in the geothermal constants are considered with respect to the geology of the region, and the possible correlative value of temperature data is suggested.--Author's abstract.

7. UNCLASSIFIED METHODS

TRANSACTIONS OF THE AMERICAN GEOPHYSICAL UNION

Tenth Annual Meeting, April 25 and 26, 1929

Eleventh Annual Meeting, May 1 and 2, 1930

National Research Council, June, 1930, Washington, D. C., 314 pp.

In the introduction to this volume the general secretary of the union, Dr. J. A. Fleming, gives the following brief summary of the papers presented at the meetings:

The tenth general assembly was held jointly, following a short business session of the Union, with the Section of Oceanography to hear general-interest papers which had been prepared for the program of the Section of Oceanography in addition to a number presented the preceding day at the Section meeting. The Section of Geodesy discussed progress-reports on gravity work in Mexico and in Europe and America and on geodetic work in Canada and in the United States, and papers on recent developments of geodetic methods, instruments and computations. In the Section of Seismology the papers were on surface-waves, the seismicity of the arctic, the forces and movements at the earthquake origin, and the practical application of earth-vibrations from dynamite blasts. The Section of Meteorology discussed the report of the meteorological division of the Committee on the Physics of the Earth of the Division of Physical Sciences of the National Research Council. The Section of Terrestrial Magnetism and Electricity held a symposium on physical theories of magnetic and electric phenomena. The Section of Volcanology heard communications on volcanic oceanic islands and the volcanic history of the San Juan Mountains of Colorado.

At the eleventh general assembly, in addition to a series of six papers on "The utility of geophysics" in geodesy, seismology, meteorology, terrestrial magnetism and electricity, oceanography, and volcanology, the Union was addressed by Sir Hubert Wilkins on "The advisability of geophysical investigation in the arctic by submarine." Progress reports on work in Canada, Mexico, and the United States, on methods for the precise measurement of time and determination of gravity, and on correlative studies of latitude-variations featured the meeting of the Section of Geodesy. In view of common interests, the Section of Seismology, after a short business session May 1, met jointly with the Eastern Section of the Seismological Society of America on the morning and afternoon of May 5 at the Bureau of Standards and May 6 at the Georgetown University; six of the papers were presented by members of the Union and a symposium on the publication of earthquake data was led by Harry Fielding Reid of the Union. The Section of Meteorology discussed the relation between the Section of Meteorology of the International Geodetic and Geophysical Union and the International Meteorological Committee, as well as reports on

units of time, solar radiation, details of instruments, data required for indicating the climatological character of a region, and final report on the Bulletin on Meteorology in the series "Physics of the Earth" to be published by the National Research Council. The papers given before the Section of Terrestrial Magnetism and Electricity dealt with the proposed International Polar Year 1932-33, the significance and importance of continuance of magnetic and atmospheric-electric observations on the oceans with accounts of instruments suitable for work at sea, secular variations in the United States and over the earth's surface, and possible relationship of earth-movements and terrestrial-magnetic variation and of the aurora and the earth's magnetism. The Section of Oceanography had two sessions, one May 1 and a second May 2, hearing papers concerned with oceanographic work in its various phases and particularly with relation to physical oceanography and its relations to marine biology and meteorology. The program of the Section of Volcanology dealt with volcanic activity and the central African volcanoes.

The Union was favored at both the tenth and eleventh annual meetings by papers from members of the national committees of Canada and Mexico reporting on the progress of governmental activities and on results of geophysical researches stimulated by the committees. The active spirit of international cooperation on the part of Canada, Mexico, and the United States was again well evidenced in these papers and by the attendance of many visitors during the two annual assemblies.—J. A. Fleming.

GULF COAST RICH IN OIL

By T. E. Dabney

Manufacturers Record, vol. 98, No. 6, August, 1930, p. 56

In this article the author briefly summarizes the results obtained n Southern Louisiana and Texas by geophysical methods of prospecting (110 dis-overies made by geophysical methods and 48 by nongeophysical methods).

The principles of the work of the torsion balance, seismograph, mag-etometer, and the gravity pendulum are mentioned.

According to Dabney, since 1921, nearly $7,000,000 has been spent by il companies on geophysical methods on the Gulf Coast alone, and at present bout $300,000 a month is being spent in this region.

The Gulf Coast must be considered one of the largest potential petro-eum reserves known to the industry.--W. Ayvazoglou.

NOTE ON A RECENT ARTICLE BY DR. HOPFNER

By Walter D. Lambert

Gerlands Beiträge zur Geophysik, vol. 26, No. 2, 1930, pp. 182-184

The article mentioned is entitled "Zur Bestimmung der Erdgestalt nach isostatischen Gesichtspunkten" (see Geophys. Abs. No. 13, p. 20).

Lambert's abstract of the present article reads as follows:

> The various determinations of the figure of the earth published by Hayford are not all strictly comparable, and indeed they are not intended to be so. This fact seems to have given rise to misunderstandings. To remove these some brief explanations are given. The effect of isostatic methods of reduction on the figure of the earth and value of various astronomical methods of determining it are briefly discussed.--Author's abstract.

UEBER DIE KONVERGENZ DER REIHE FÜR DAS ÄUSSERE RAUMPOTENTIAL

(ON THE CONVERGENCE OF THE SERIES FOR THE EXTERIOR POTENTIAL OF SPACE)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 27, No. 1, 1930, pp. 36-41

The question concerning the sphere of convergence in the development of the series for the exterior potential of a sphere is especially important for geophysics owing to the fact that the validity of a number of fundamental formulas, such as Clairaut's theorem, Bruns' theorem and others, depend on the answer to this question.

In this article the author shows that the development of the potential of space in series of spherical harmonics for the exterior space is convergent also in a certain region of the interior space of the attracting mass.--W. Ayvazoglou.

THE GEOLOGIST OF TODAY AND YESTERDAY

Editorial note

The Petroleum Times, vol. 24, No. 610, 1930, pp. 451-454

After the description of the work of a geologist for mapping out the structure of the underground from surface observations the geophysical means of prospecting, especially for oil, are discussed. Seismic, gravitational, and magnetic methods are briefly examined. Cooperation of the geologist, geophysicist, and the palaeontologist is at the present time required in order to reduce the chances of failure in drilling for oil.--W. Ayvazoglou.

THE WORK OF THE GEOPHYSICAL INSTITUTE OF THE CENTRAL GEOLOGICAL AND PROSPECTING SERVICE IN U.S.S.R. IN 1928-29 (IN RUSSIAN)

By J. Lepeshinsky and V. Chernobrovin

Osvedomitelniy bulletin po poleznim iskopaemin, vol. 3, No. 2, pp. 15-19 and No. 3, pp. 18-23

The importance of geophysical methods of prospecting caused the reation in 1929 of a special Geophysical Institute for geologic-prospecting ork with the following sections: Electrotechnical, magnetic, gravimetric, adiometric, seismic, and geothermal.

In this article the authors give the results of the work carried out uring 1928-29 by the above-mentioned sections in the different regions of the .S.S.R.--W. Ayvazoglou.

GEOPHYSICAL METHODS APPLIED TO EXPLORATION AND GEOLOGIC MAPPING

By T. M. Broderick and C. D. Hohl

U. S. Geological Survey, Professional Paper 144, 1929, pp. 156-168

The article forms a part of the work entitled "The Copper Deposits f Michigan," by B. S. Butler and W. S. Burbank. The authors discuss the ossibility of application of geophysical methods to the exploration and geo- ogic mapping of the region.

Theory and practice of magnetic surveying is mentioned especially.-- . Ayvazoglou.

INSTRUMENT FOR DETECTING METALLIC BODIES

By Theordore Theodorsen

Journal of the Franklin Institute, vol. 210, No. 3, 1930, pp. 311-326

This paper gives a description of a new instrument recently developed y the National Advisory Committee for Aeronautics at the Langley Memorial eronautical Laboratory (N.A.C.A. detector). The instrument was made for the mmediate purpose of locating unexploded bombs which were known to have been ropped from airplanes at targets in close proximity of the site of the new eaplane Towing Channel at Langley Field, Va. The new "detector" successfully ocated a number of bombs buried on and near the projected site. It is of a imple design and requires no skilled operators.

The author gives a brief theoretical survey of the general nature of he difficulties encountered in the design of sensitive detectors of this type. e points, in particular, to the importance of avoiding capacity and resistance ffects, and outlines other essential factors contributing to the success of he new detector.

Thirteen figures illustrate the article.--Author's abstract.

FORTSCHRITTE DER ANGEWANDTEN GEOPHYSIK

(ATTAINMENTS OF APPLIED GEOPHYSICS)

By J. B. Ostermeier

Internationale Zeitschrift fuer Bohrtechnik, Erdölbergbau und Geologie, vol. 38, No. 16, 1930, 14 pp.

In this article, which is a reprint of a lecture delivered by Ostermeier before the second general meeting of the International Oil-Union held on June 14, 1930, in Vienna, the author notices the attainments made by geophysical methods of prospecting.

Gravitational, seismic, electrical, and magnetic methods are discussed, based on examples.

Photographic pictures of instruments and a series of diagrams are shown in 21 figures illustrating the article.--W. Ayvazoglou.

SOCIETY OF PETROLEUM GEOPHYSICISTS

Editorial note

Bulletin of the American Association of Petroleum Geolcgists, vol. 14, No. 10, 1930, pp. 1364-1365

Information on the organization of the Society of Petroleum Geophysicists is given. The object of the society is to bring together geophysicists who are engaged in oil work and to advance the science of the application of physics in oil geology.

The requirements for membership are enumerated.

The following officers were elected: President, Donald C. Barton; vice-president, E. E. Rosaire; secretary-treasurer, John Weinzierl.

Application blanks may be obtained from the secretary at 608 Petroleum Building, Houston, Tex.--W. Ayvazoglou.

8. GEOLOGY

SURFACE GEOLOGY OF COASTAL SOUTHEAST TEXAS

By Donald C. Barton

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 10, 1930, pp. 1301-1321

The formations at the surface in coastal southeast Texas are the "Lissie," Beaumont, Recent, and Recent Terrace deposits. The Hockley scarp, one of the most striking physiographic features of the region, is a flexure

carp partly buried by alluvial deposits. The area in front of the Hockley carp in southeast Texas is largely a deltaic plain composed of the coalescent eltas of late Pleistocene Trinity and Brazos Rivers. The sands of the area f the Lake Charles loams and sands, currently mapped as Lissie, are continuous ith the sands of the distributary ridges and are contemporaneous with the surace Beaumont clay, and that part of the Lissie at the surface seaward of the ockley scarp is younger than that lying landward of the scarp and is a sandy hase of the Beaumont. An uplift of 20 to 30 feet is indicated in Orange ounty and in Cameron and Calcasieu parishes. A veneer of Recent sediments overs the seaward edge of the Beaumont clay. Two, possibly three, postleistocene terraces are present in the valleys of the major streams. The oils of the early Recent terrace show the introduction of material from the ermian "Red Beds."--Author's abstract.

DIE ENTSTEHUNG DER KONTINENTE

(THE ORIGIN OF THE CONTINENTS)

By Josef Geszti

Gerlands Beiträge zur Geophysik, vol. 27, No. 1, 1930, pp. 1-25

In the ancient form of the earth the liquid sima masses were everyhere,--in the same height of strata--enveloped by light, molten sial masses. his concentric distribution of material, however, has been disturbed later on. t present the continents consist of sial and the bottoms of the oceans mostly f sima materials (vertical separation of material). It has been shown that his distribution of masses was created by thermodynamic effect.

The elevation of the continents has been attributed to the condensaion of the sima masses, specially on the point of becoming solid during the ransition from liquid to crystallized state.

The origin of the thermodynamic effect is being attributed to the nhomogeneous sial masses containing various auxiliary mixtures.--Author's bstract.

USE OF AIRPLANE PHOTOGRAPHS IN GEOLOGIC MAPPING

By Walter A. English

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 8, 1930, pp. 1049-1058

The demand for airplane photographs during the World War caused a rapid evelopment in equipment and methods. This demand and the improvements in airplane performance laid the foundation for the present commercial applications of airplane photography. Many oil companies use photographs in field mapping and find several peculiar features of the photographs of particular value in geologic mapping.

Mosaics of various types are used for compilation of data, but line maps and contour maps can be constructed from photographs if maps of a greater degree of accuracy are desired.--Author's abstract.

9. NEW BOOKS

Breyer, Johannes, Ueber die Elastizität von Gesteinen (On the Elasticity of Rocks). Published by the "Preussiche Geologische Landesanstalt," Berlin, 1929, 53 pp., 5 tables, 9 figures, 3 synoptical tables. Price, R.M. 3-75.

Castelfranchi, Gaetano, Engineer of the École Superieure des Ingenieurs de Milan. Physique Moderne, Exposé Synthétique et Méthodique de la Physique d'Aujourd'hui et des travaux theoriques et experimentaux des plus grand physiciens contemporains (Modern physics, synthetical and methodical expose of present physics and theoretical and experimental works of the most celebrated contemporary physicists). Translated into French by M. A. Quemper de Lanascol, Laureat de l'Institut. 660 pp., illustrations. 8-vo. Paris. Librairie Scientifique Albert Blanchard, 1930. Price, 70 fr.

Kohlrausch, Friedrich. Lehrbuch der praktischen Physik (Handbook of Practical Physics). 16th enlarged edition. Revised by W. Bothe, E. Brodhun, E. Giebe, E. Gruneisen, F. Hoffmann, K. Scheel and O. Schönrock. XXX and 800 pages, 395 figures. Leipzig, 1930. Teubner. Price: Stitched, R.M. 23, bound, R.M. 26.

Vernadsky, W. J. Geochemie in ausgewählten Kapiteln (Selected Chapters on Geochemistry). Translated from Russian by Dr. E. Kordes, Leipzig, 1930. Akademische Verlagsgesellschaft m.b.H. 370 pages. Price: R.M. 23; bound R.M. 25. Chapter I: History of geochemistry; II, Chemical elements and the different ways in which they occur in the earth's crust; III, Geochemistry of manganese and considerations of energy; IV, Silicon and silicates in the earth's crust; V, Carbon and the vital substance in the earth's crust; VI, The radioactive elements in the earth's crust.

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2 - Mining division, U. S. Bureau of Mines.

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